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natural disasters

Spring 1999 Produced by the North Carolina Museum of History

Tar Heel

JUNIOR HISTORIAN

North Carolina History for Students

North Carolina has had many natural disasters throughout its recorded history. In its earliest years as a colony, a group of English colonists disappeared. Their settlement became known as the Lost Colony. In the many years since that time, many people have suggested a variety of different theories about their disappearance. Some suspect that the members of the famous Lost Colony were affected by a natural disaster of some kind: a drought, a blight, a hurricane, for example. As time went by, this land experienced more natural disasters—sandbars sank ships along the coast, wildfires burned the Piedmont, and ice storms coated the mountains. In 1864, during the Civil War (1861–1865), an epidemic of Yellow Fever in the coastal town of New Bern killed almost one thousand people in only a few months. In 1916, the lives of residents in several mountain counties were affected by floods. In 1954, Hurricane Hazel (cover photo) caused so much damage to parts of the Tar Heel coast that many thought the area would never recover, but it did. Even in your time, the natural disasters have continued to come. In 1996, another hurricane, known as Fran, devastated much of eastern North Carolina. And more recently, a deadly tornado destroyed much of Stoneville in 1998. These are only a random sampling of the natural disasters that have affected our area over the years. This issue of Tar Heel Junior Historian *presents information on some of these and others. The list, as you can guess, goes on and on and continues to grow. Good luck in discovering history through natural disaster.*

The cover photo is used courtesy of the North Carolina Collection at the University of North Carolina at Chapel Hill.

Do you have an idea for a future topic? Or a suggestion for changing something in the future? Even if you have a complaint or comment about this issue, I want to hear it. You can reach the editor of THJH *by e-mail at THJHAclubs@mob.dcr.state.nc.us ;-)*

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Tar Heel Junior Historian
North Carolina History for Students

Tar Heel Junior Historian Association

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A tragedy, a disaster—Just what *would* you call it?

by Brian Averette

Beware—some day, without any warning, before you can even try to prepare, a **tragedy** could wreck your daily routine, even disrupt your entire life. Your house could burn down, a relative could become seriously ill, a friend could be hurt in an accident.

The physical effects that result can be bad enough: burns, broken bones, scars. Sometimes, in addition to the initial pain and suffering, a tragedy can even result in death. On top of the physical effects, you will usually have emotional scars to live with: the memories of frightening moments, the absence of loved ones, the loss of security.

Now, think about a tragedy that might affect the lives of a larger group of people—more than yourself, more than your family, more than your small circle of friends. Now, you have a **disaster.**

Though you may not think about diseases when you think about natural disaster, in reality, pestilence can cause more deaths and affect more lives than hurricanes, tornadoes, blizzards, droughts, or any of the other natural disasters you might think of. The first recorded plagues in the New World were introduced by the earliest European explorers who landed here. Just by landing on these shores and making contact with the natives, the newcomers started this natural disaster. Eventually, even natives who had never seen a "white man" were dying from his diseases.

Pestilence—a killer of millions

Pestilence" is a word that we do not hear too often in modern times. But in the past, pestilence, or **contagious** diseases of **epidemic** proportions, caused more deaths, affected more lives, and started more changes than any other type of **natural** disaster. In Europe, during the mid-1300s, one plague (known as the Black Death) killed as many as 25,000,000 people. In London, another plague, in the mid-1660s (known as the Great Plague of London), killed more than 70,000 of the city's population of about 460,000.

The first American natural disaster?

North Carolina has had its own experiences with pestilence. As with all natural disasters, plagues have natural causes and have beginnings in our everyday surroundings. When the first European explorers landed in the New World, they did not know that simply by arriving and greeting the native people, they were also introducing new diseases. (After all, they knew little about diseases themselves.)

But that is just what happened. Over the centuries, Europeans had slowly built up resistance to many common diseases. They had also created or discovered cures for some and found practices that eased the symptoms of others. But the native peoples here, in a new and distant land, had no natural immunities or treatments.

Diseases such as chicken pox, smallpox, measles, and influenza were easily passed among native groups. Once introduced, diseases spread rapidly and uncontrollably. The illnesses had no concerns about whose lives they touched. Today's researchers believe that perhaps as many as half of the native population may have died in this way during the first hundred years after European contact.

Modern plagues

Unfortunately, North Carolina has had other brushes with pestilence. Just since the turn of the 1900s, the Great White Plague (which became known as consumption and later as tuberculosis, or TB), Spanish influenza, and polio have touched the lives of many of our parents, grandparents, and great-grandparents.

Even today, with the protection of modern medicine and the promise of high-tech research, we have an epidemic among us known as AIDS (acquired immune deficiency syndrome).

Definitions, pages 1–5

Aftershocks are small ground movements that are felt after the large shocks of a main earthquake. Aftershocks may last for several days.

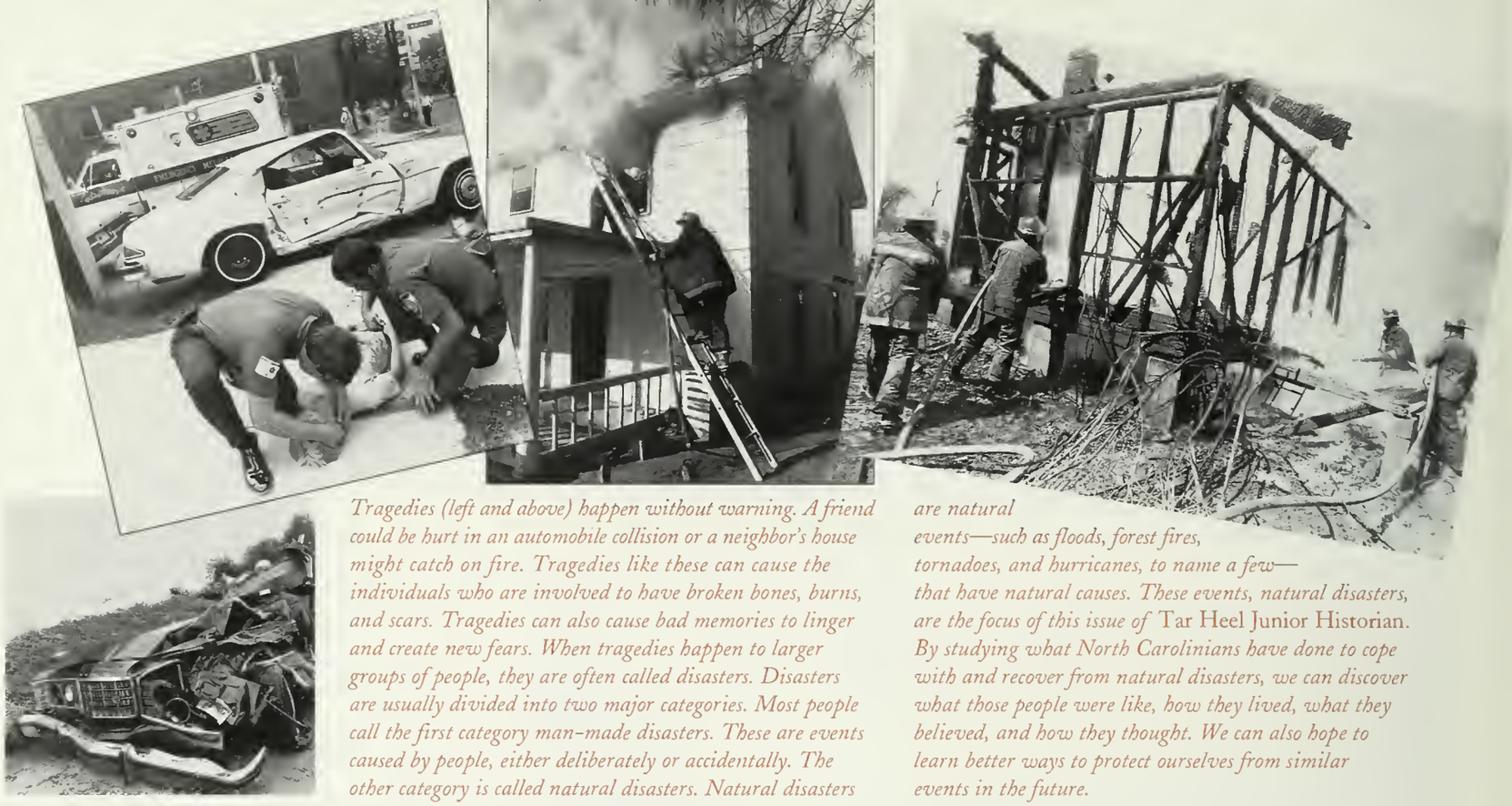
*In this case, **ancient** is the historical time period dating from the earliest known civilizations to about A.D. 476, the fall of the western Roman Empire.*

*An **arson** fire is a fire that is intentionally started by someone.*

*A **comet** is an object in the sky that has a regular and recurring orbit, similar to a planet, around the Sun. Comets are characterized by bright "heads" and long cloudy tails that always point away from the Sun.*

*A **contagious** disease can be spread from one person to another. Contagious diseases can spread to infect a family, a community, an area, or a region.*

*In this case, **craters** are depressions in the ground*



Tragedies (left and above) happen without warning. A friend could be hurt in an automobile collision or a neighbor's house might catch on fire. Tragedies like these can cause the individuals who are involved to have broken bones, burns, and scars. Tragedies can also cause bad memories to linger and create new fears. When tragedies happen to larger groups of people, they are often called disasters. Disasters are usually divided into two major categories. Most people call the first category man-made disasters. These are events caused by people, either deliberately or accidentally. The other category is called natural disasters. Natural disasters are natural events—such as floods, forest fires, tornadoes, and hurricanes, to name a few—that have natural causes. These events, natural disasters, are the focus of this issue of Tar Heel Junior Historian. *By studying what North Carolinians have done to cope with and recover from natural disasters, we can discover what those people were like, how they lived, what they believed, and how they thought. We can also hope to learn better ways to protect ourselves from similar events in the future.*

From tragedies to disasters

While a tragedy can cause grief and a sense of loss to an individual or a family, a disaster causes hardship and ruin to communities of people—passengers on a bus or an airplane or residents of a neighborhood, a region, or a country. Disasters are commonly divided into two major categories.

The first category is usually called man-made disasters, or technology-based disasters. These are events caused by people, either deliberately or accidentally. A list of man-made disasters might include automobile collisions, airplane crashes, high-rise building fires, bridge failures, bomb explosions, and pollution-related diseases.

Man-made disasters can also include events in which humans have interfered with nature. One example of this kind of man-made disaster is a rainstorm that develops into a flood or a **mud slide** because people have cut down or killed too many trees.

Definitions (continued)

that were formed by the impact of a meteorite.

A disaster is a sudden and unexpected event, misfortune, or mishap that causes pain, hardship, and ruin to a community of people. A natural disaster is a natural event with a natural cause that leads to disaster. Natural disasters can include hurricanes, tornadoes, blizzards, droughts, epidemics, and plant blights, to name a few.

An epidemic disease is a contagious illness that hits an area suddenly. Epidemics usually afflict large numbers of people within a region or community at the same time.

When the first European explorers arrived in the New World, they met native people that had existed here for thousands of years. These Native American cultures began to change after European contact, or after they met white explorers. After contact, native peoples began to change some of their practices and to adopt some European technologies.

WE'RE NUMBER ONE! . . . in the number of reported meteorites? . . .

Scientists have recently suggested that the weight of the Earth increases every day. In fact, they have figured that the weight increases about 910 **metric tons** every year. Where does this weight come from?

They say it comes from pieces of **meteorites**. Most are pieces so small that they are invisible to the naked eye. But others are large enough to form craters when they hit the Earth's surface.

. . . That's right—number one

North Carolina is no stranger to **meteors** and meteorites. Major sightings of meteors were reported in the state in November 1833 (during the "night the stars fell"), October 1849, August 1860, May 1874, December 1893, and December 1934. North Carolina in fact ranks number one in the number of meteorites reported.

The mystery of Carolina Bays

One of the state's most mysterious geographic features traces its possible roots to a shower of large meteorites that may have struck southeastern North Carolina and northeastern South Carolina thousands of years ago. When these meteorites hit the ground, they gouged craters into the surface. Over the years, the oval-shaped craters have become lakes, swamps, **pocosins**, **savannahs**, and **peat** beds. They are now known as the Carolina Bays.

Of course, scientists have suggested more than a dozen other theories about the origins of the Carolina Bays. One of those theories is based on a different kind of heavenly body—a comet that collided with the Earth about 50,000 years ago.

Yes, comets, too!

According to an article in the December 1933 issue of *Harper's Magazine*, "The comet that struck the Carolinas" was responsible for considerable damage.

Another example is an **arson** fire that burns out of control and consumes an entire forest.

The second category of disasters is usually called **natural disasters.** Natural disasters commonly start out as sudden and unexpected events in our everyday surroundings. They are natural events—such as floods, forest fires, tornadoes, and hurricanes, to name a few—that have natural causes.

Natural disasters have taken place throughout history. They have not changed much. But, to discuss them and their impacts, we need to realize that, while disasters may be the same, some ideas about them have changed over the years.

While no one knows quite why, North Carolina has recorded more meteor sightings and meteorite landings than any other spot in North America. Meteors and meteorites are not normally thought of as natural disasters that threaten our lives. But if a large-enough meteor did hit near the Tar Heel State, it could trigger a tsunami or effects similar to a minor earthquake. During the "night the stars fell" on November 13, 1833, though, viewers all around the Earth felt primarily fear—a common feeling for that time but not one many of us would feel today. "The people of the entire state, from the mountains to the sea, were excited, thrilled, shocked, and, doubtless, thoroughly alarmed," said an article in the Winston-Salem Journal-Sentinel *one hundred years later. "Many people . . . were so frightened that they believed the end of the world had come, and leaving their houses . . . fled with their families."*

Beliefs and background knowledge are different

First of all, what we believe and what we know about natural disasters have changed. Think about the passing of a comet across the sky, for example. To the **ancient** Greeks and Chinese, as well as **medieval** Europeans, the sight of a comet was as much a sign of disaster as the rains of a flood, the pains of a **famine** or an **epidemic,** or the winds of a hurricane. Although the comet did not hurt anyone, it still worried, even terrified, all who saw it.

In more modern times and closer to home, when a series of minor earthquakes shook Rutherford County in 1874, neighboring residents became extremely fearful. On February 10, and for two or three months after, the deeply religious people who lived in this area believed the **tremors** and **aftershocks** they felt were a sign of God's anger. Some even feared that the rumblings signaled the end of the world.

Would you have these thoughts and feelings if you saw a comet or felt an earthquake today? Probably not—these are examples of the kinds of ideas that have changed.

Populations and property are different

Another idea that has changed is the very definition and **perception** of "disaster." Early definitions of the term did not mention measurements of death or destruction. In

In this article, two scientists used a then-new technology called aerial photography to gather evidence about the **prehistoric** comet. They said their research suggested that even before the comet actually struck the Earth, pressures and heat caused its main body to explode. Pieces of the comet's debris then scooped out the Carolina Bays as they landed.

Are meteorites and comets **natural** disasters that threaten life on Earth? It seems possible but not likely that we need to worry. After all, the Earth is "already being bombarded every day by billions of meteorite[s]." But when they enter the Earth's atmosphere, the bodies heat up and melt, burn up, or break into tiny pieces.

At least in recorded history, "Nothing bigger than [a city block] has survived passage through the atmosphere," says one specialist. So, don't start to worry or pack your bags, yet.

Definitions (continued)

Famine is the opposite of feast: it is a lack of food, often for extended periods of time.

Also known as the Middle Ages, medieval times are the years in European history from about A.D. 500 to roughly 1300, when the Renaissance started.

A particle or piece of solid matter that enters the Earth's atmosphere from space is a meteor. Most meteors burn up in a brilliant flare of light as they near the Earth's surface. Some, however, survive to hit ground. These pieces are called meteorites, and they come in a variety of small shapes, sizes, and weights.

Meteorologists are people who study the science of weather conditions and forecasting.

Metric tons are a way of measuring mass and weight—one metric ton is equal to 1,000 grams, or about 2,200 pounds in our American system (one ton in our system is 2,000 pounds).

Definitions (continued)

A mud slide is one type of avalanche—a large mass of material sliding rapidly down a mountainside or over a cliff. We usually think of avalanches as being made of snow, but they can also be made of dry dirt or rocks (commonly called landslides) or wet dirt or rocks, or mud (which are commonly called mud slides).

The New World was another term for the Americas—a new and unexplored land. The Old World was Europe.

Peat is a substance made of partly rotted vegetation, especially moss, which grows in moist, spongy soil. It is raised, dried, and sold for use as a soil substitute, fertilizer, or fuel.

Perception is the way that we use our own experiences and observations to "see" things, or to think about ideas and concepts in relation to our own surroundings and our own times.

A pestilence is a deadly epidemic—a contagious and often rapidly spreading disease that results in great numbers of deaths.

In a general sense, a plague is any kind of pestilence, or deadly epidemic. But in history, plagues are often thought of as contagious diseases that are carried by rats and then passed either from the rats to humans or from human to human.

Pocosins have the same basic ground composition as swamps or marshes, but instead of lying in low areas that gather excessive amounts of water, pocosins lie on hills or other places where drainage should not usually be a problem.

Prehistoric times were times in which cultures did not have a written language. We therefore

modern times, though, we often think of a disaster as an event during which many people are killed or much property is destroyed.

Indeed, a disaster such as a hurricane does have a greater impact today than it did one, two, or three hundred years ago. The reason for that is simple. Before colonial days, the coast of what has become North Carolina was not covered with hotels, condominiums, businesses, houses, and roads or with people.

Instead, a relatively small population of native peoples lived in small, remote villages.

Shakin', Rattlin', and Rollin'

Surprisingly, the area we know as North Carolina is no stranger to earthquakes. The first recorded quake in the colony was mentioned in records from the town of Bath on March 8, 1735, and another was reported in present-day Winston-Salem on February 21, 1774. North Carolina's own earthquake, in the first half of 1874, was actually a series of more than seventy-five tremors that were centered near Bald Mountain in McDowell County. Residents of the area were so alarmed and so sure "the end of the world was at hand, [they] assembled in crowds for prayer. Early in the morning they sent for a . . . preacher, and so impatient were they for his arrival that a part of the crowd went to meet him on his way." In all, more than eighty quakes have shaken North Carolina in recorded history.

Although the Tar Heel State is not often considered to be in earthquake territory, the area has had its share of **tremors** and **temblors** over the years, and even some major "quakes." Considering that scientists estimate that several million earthquakes take place every day (though almost all are undetectable), logic suggests that North Carolina should experience rumbling ground at least occasionally. Surprisingly, at least eighty-three earth tremors have been recorded in this area.

North Carolina is not a total stranger to earthquakes

The region's best-documented major earthquake was centered near Charleston, South Carolina. The "Great Charleston Earthquake" of about 9:50 P.M. on Tuesday, August 31, 1886, destroyed much of Charleston and gave residents all up and down the Atlantic coast reason to worry about a kind of **natural disaster** they had not worried about before.

The quake was felt over most of North Carolina. In Charlotte, gaslights flickered, plaster ceilings fell, and everything shook. In Durham, chimneys collapsed. In Raleigh, church bells rang on their own. In Fayetteville, "a child was thrown from his bed." In Wilmington, New Bern, and Swan Quarter, chimneys fell away from houses, windowpanes cracked, and land levels dropped along the coast—about eighteen inches, according to fishermen and farmers.

For the most part, though, North Carolinians were just scared. "All around town, . . . buildings were doing strange dances," says a report in the Greenville *Reflector*. "Windows rattled and broke and anything not nailed down began to roll around. People were rushing out into the street.

"The shaking of the earth prompted much prayer. . . . A few in the local pubs, caught between the sway of booze and sway of the [ground], sobered up and vowed 'never again!'"

One to call our own

"During the latter part of February and nearly the whole of March, [April, and even the beginning of May, 1874,] the people in the vicinity of Bald Mountain, in the county of McDowell, . . . were alarmed by mysterious noises and rumblings in the interior of that mountain."

According to this article in the national newspaper *Harper's Weekly*, the first news reports predicted that the mountain was becoming an American Vesuvius—a volcano! Melting snow at the top of its peak helped support those reports. Actually, though, the rumblings of Bald Mountain were the noises of North Carolina's own earthquake.

"During the night of February 22, the noises were so alarming that people thought the end of the world was at hand. . . . This excitement continued nearly three weeks, and during that time no attention was given to labor or property."

No major event followed the activity of those months—no volcano, no earthquake, no end of the world. While rocks fell, ground shook, and "people made right with their fellow men," the mountain—now known as Rumbling Bald Mountain—quieted and has not been heard from since.

When a hurricane struck, it might not have been perceived by these natives as a disaster at all—only a tragedy. Today, however, billions of dollars have been invested in coastal development, and hundreds of thousands of people live in coastal areas. When a hurricane strikes today, the damage to man-made property is not slight—it is tremendous.

Learning from our past

Sometimes we learn from natural disasters so that we can survive better when a similar event occurs again. One example is the "good" that followed the 1918 influenza epidemic, which killed more than 13,000 North Carolinians in only a few months. This **pestilence**, however, inspired efforts to create county boards of health and led to the formation of rural health clinics so that people who lived far from regular hospitals could receive local care.

North Carolinians have learned lessons from surviving other past events, as well. We have developed ways of identifying some possible disasters. We have also found ways of helping to prevent some of them. In the worst cases, we have learned ways to better respond to and cope with them afterward. As examples, lighthouses and other warning signals were installed to warn sailors to steer clear of dangerous spots along the coast.

In addition, lifesaving crews and the Coast Guard began to save people, property, and ships. Radio communications assisted rescue workers and recovery agencies in coordinating their efforts. Radar and finely tuned instruments, as well as satellite technology, provide more accurate predictions about the strength, speed, and direction of approaching storms. Teachers and **meteorologists** teach us about different kinds of weather watches and warnings and offer us advice about what to do when one is issued.

Certainly, then, natural disasters have played a role in our state's history. By seeing how different groups of North Carolinians have responded to different events at different times, we can gain insights into what those people were like, how they lived, what they believed, and how they thought. By studying past natural disasters, we can also hope to learn better ways to protect ourselves from natural disasters in the future.

Definitions (continued)

have no written, or historic, records about the people or events of those times.

*In this case, **remote** is another word for isolated or separated from other villages.*

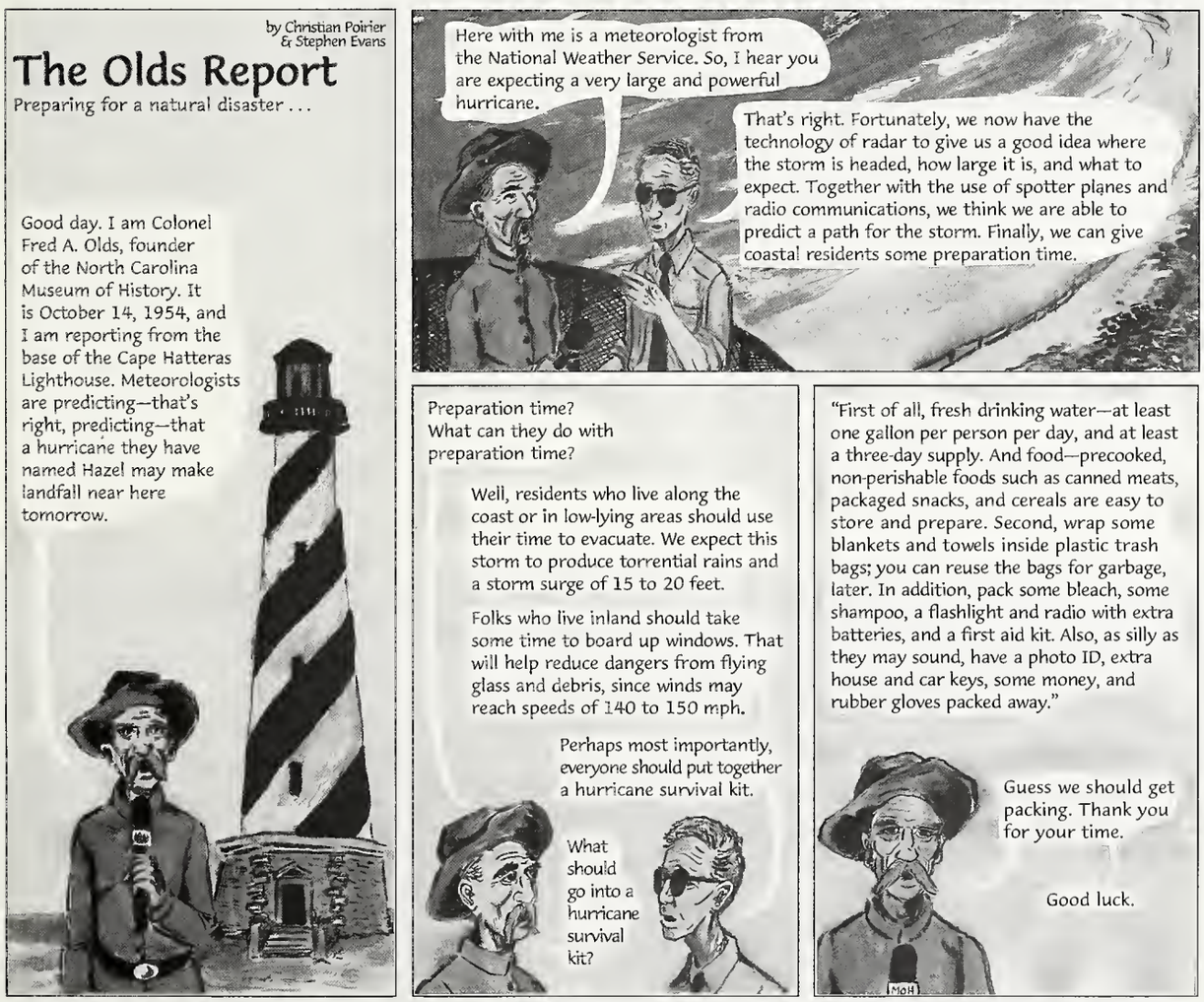
*In this case, **resistance** is the human body's ability to fight a disease because it has been exposed to the germs that cause that disease for long periods of time, even generations.*

Savannahs are large, treeless, grass-covered plains.

*A **tragedy** is usually thought of as an unfortunate and discouraging or defeating event or series of related events.*

Tremors and temblors are words used to describe the shaking movements associated with an earthquake.

Vesuvius is a mountain volcano near Naples, Italy. Mount Vesuvius has been famous since its A.D. 79 eruption that buried at least three cities, one of them Pompeii. Its most recent major eruption was in 1944.


by Christian Poirier & Stephen Evans
The Olds Report
Preparing for a natural disaster . . .
Good day. I am Colonel Fred A. Olds, founder of the North Carolina Museum of History. It is October 14, 1954, and I am reporting from the base of the Cape Hatteras Lighthouse. Meteorologists are predicting—that's right, predicting—that a hurricane they have named Hazel may make landfall near here tomorrow.
Here with me is a meteorologist from the National Weather Service. So, I hear you are expecting a very large and powerful hurricane.
That's right. Fortunately, we now have the technology of radar to give us a good idea where the storm is headed, how large it is, and what to expect. Together with the use of spotter planes and radio communications, we think we are able to predict a path for the storm. Finally, we can give coastal residents some preparation time.
Preparation time? What can they do with preparation time?
Well, residents who live along the coast or in low-lying areas should use their time to evacuate. We expect this storm to produce torrential rains and a storm surge of 15 to 20 feet.
Folks who live inland should take some time to board up windows. That will help reduce dangers from flying glass and debris, since winds may reach speeds of 140 to 150 mph.
Perhaps most importantly, everyone should put together a hurricane survival kit.
What should go into a hurricane survival kit?
"First of all, fresh drinking water—at least one gallon per person per day, and at least a three-day supply. And food—precooked, non-perishable foods such as canned meats, packaged snacks, and cereals are easy to store and prepare. Second, wrap some blankets and towels inside plastic trash bags; you can reuse the bags for garbage, later. In addition, pack some bleach, some shampoo, a flashlight and radio with extra batteries, and a first aid kit. Also, as silly as they may sound, have a photo ID, extra house and car keys, some money, and rubber gloves packed away."
Guess we should get packing. Thank you for your time.
Good luck.
MOH

Brian Averette is a volunteer guide at the Museum of History. He has a history degree from Wake Forest University in Winston-Salem.

"Bald Mountain settlers in fear" is copied from the April 11, 1874, issue of Harper's Weekly. *The print, "the night the stars fell," depicts the Leonid meteor shower of 1833 and is not traceable to a single source. All other artwork is from the North Carolina Division of Archives and History.*

"The Olds Report" was conceived and illustrated by Christian Poirier of Raleigh.

A natural disaster all our own—the Graveyard of the Atlantic

Few other places in the world are as protected by a natural barrier as North Carolina, whose shoreline is protected by a nearly complete string of barrier islands. The Outer Banks off our shores protect the mainland from stormy winds and wild surfs (above). But they also prevent and discourage the safe passage of shipping traffic. The invisible shoals, shifting sandbars, and overpowering waves of our Outer Banks have stranded (next page, top), damaged, destroyed (right), and sunk so many ships and claimed so many lives over the years that the area has long been known by sailors as the Graveyard of the Atlantic—our own natural disaster.

Throughout much of history, ships and sailors were subject to any number of possible **natural disasters** and **hazards** as they slowly crossed the Atlantic Ocean. These dangers were everyday problems. In the **Graveyard of the Atlantic,** which lies off the coast of what has become North Carolina, running into unseen **shoals** and shifting sandbars or being crushed by overpowering waves added even more dangers.

Around the turn of the 1800s, the earliest lighthouses were built to provide assistance in maneuvering North Carolina's most dangerous coastal spots. Bald Head (first lighted in 1795), at the mouth of the Cape Fear River, and Shell Castle (first lighted between 1798 and 1803), at Ocracoke Inlet, were the first. Still, many ships and sailors continued to meet misfortune along the stretches of coast that remained.

Individuals who lived in communities along the coast did their best to save people who found misfortune close to shore. And groups in some areas actually did organize into volunteer rescue units. But not until the mid-1800s did either the state or **federal** government begin to try controlling and funding rescue or lifesaving groups.

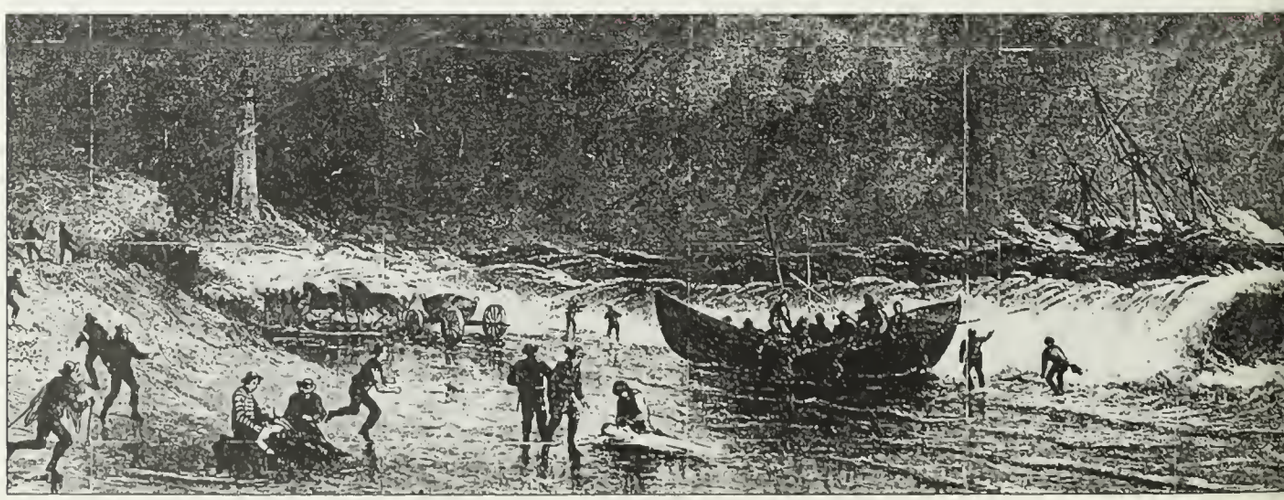
Saving people from disaster

Finally, the United States Life-Saving Service (USLSS) was established. The USLSS was a small **maritime** organization established by the federal government in 1870. The USLSS was responsible for building lifesaving stations along the coasts of the Atlantic Ocean, the Pacific Ocean, the Gulf of Mexico, and the **Great Lakes.**

North Carolina started with seven USLSS stations—Jones Hill/Currituck Beach, Caffeys Inlet, Kitty Hawk, Nags Head, Bodie Island/Oregon Inlet, Chicamacomico, and Little Kinnakeet.

Each USLSS station was responsible for an assigned section of shore, and each was manned with a crew—a **keeper** and about six **surfmen.** During clear, daylight hours, a surfman was stationed to watch the waters from the tower of the station. In bad weather or at night, each surfman took his turn walking that station's section of beach.

If a surfman noticed a ship in distress, he first lit a **Coston light** to signal the ship and let its captain and crew know they had



Definitions, pages 6–12

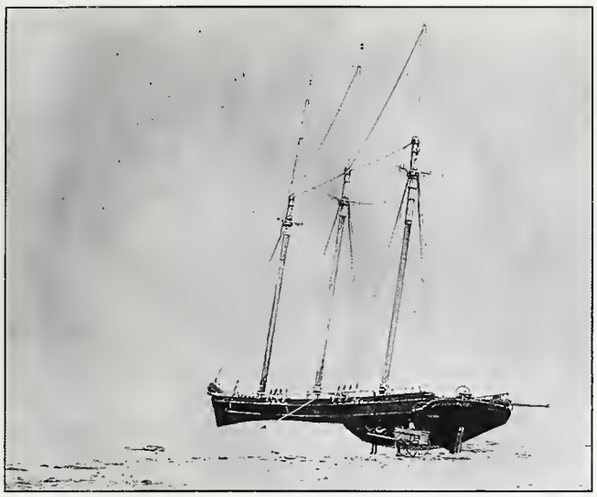
In this case, a ***benchmark*** *is an event from the past that is remembered and used as a base for comparing newer, similar events. A benchmark hurricane, for example, was the biggest and "baddest" hurricane in memory and is the hurricane that all more recent hurricanes must live up to.*

The ***bow*** *of a boat or ship is its forward part, the front.*

A ***breaker*** *is a large wave. Breakers "break" into foam when they hit the shore.*

The ***Caribbean Sea*** *is the body of water that lies on the north coast of South America (along the shores of Venezuela and Colombia), follows the east coast of Central America and the Yucatan Peninsula of Mexico, and then curves along the southern and western shores of the Antilles (including Cuba and Puerto Rico) back to Venezuela.*

*The term "**colored**" was used at this time, and for much of the 1900s, to identify a member of the Negro race. Today, we usually use the word "black" or African American to serve the same purpose.*



been spotted. He then ran back to his station and gave a report of the scene with weather conditions and ship information. Based on this report, the keeper decided on a plan of action. He gathered the station's crew and the equipment he thought would be necessary and moved to the scene as quickly as possible. Any delay in response or mistake in equipment could mean death for the stranded sailors.

In their earliest years, most USLSS stations did not have horses or mules. The crew members themselves had to pull the heavy equipment that they needed for their rescue attempts—surfboats and oars or sails; tools like ropes, pulleys, and hooks; first aid supplies; and a **line-throwing** gun of some sort, gunpowder, and shells. Though most of this equipment was on wheeled carts, it had to be pulled through loose sand and almost always during a windy, rainy storm.

The Lyle gun

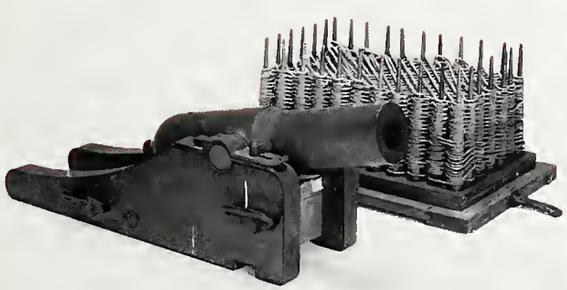
Most of the ships that wrecked off the **Outer Banks** wrecked in shallow waters close to shore. For these rescues, the most important piece of equipment was a line-throwing gun called a **Lyle** gun.

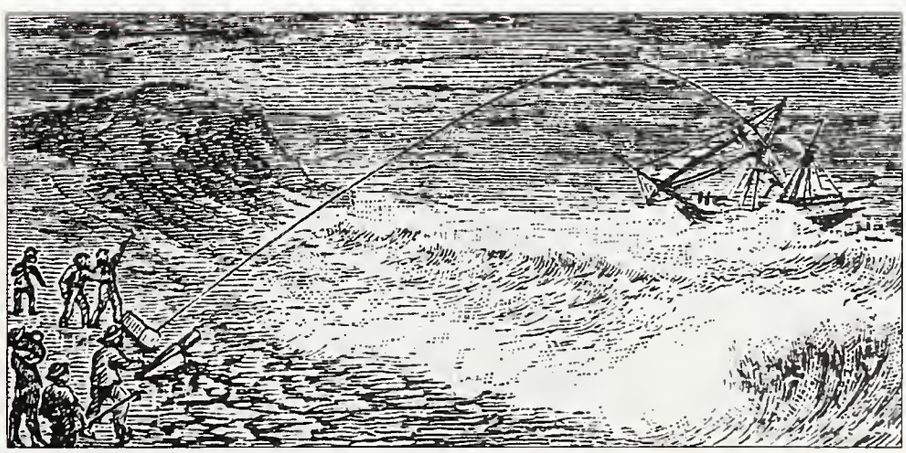
Actually a small cannon, the Lyle gun shot a weighted **line** from the shore to the ship. Sailors on the ship tied this line to a **mast** or other solid part of the ship. While the sailors were doing this, the surfmen buried their end of the line in the beach, securing it with a "sand anchor." If all went well and the weather cooperated, this line was then used to transport passengers from the ship to the shore.

Wrecks in deeper waters or farther from shore required the use of boats. The boats commonly used in North Carolina were called surfboats. Surfboats were built to carry sixteen to eighteen people, but in bad storms when a ship was quickly sinking or falling apart, surfboats were loaded with as many people as possible. The lifesavers often battled storm-powered waves, strong currents, blinding winds, and sheet after sheet of rain to make these rescues.

North Carolina's USLSS stations were kept busy for many years. In addition to saving ships and rescuing people, surfmen helped to repair and refloat ships that had only small amounts of damage, confiscated and protected cargo and baggage that washed ashore, recovered human bodies and animal carcasses that appeared on the beach, and kept order in their station and along their assigned sections.

The United States Life-Saving Service (USLSS) was established in 1870 to help rescue crews and passengers who found their ships in trouble close to shore (previous page, bottom). North Carolina originally had seven stations to help disabled ships off the Outer Banks. Each station was manned with one "keeper" and about six surfmen, who braved strong winds and rainy storms to get their work done. In most cases, their most important piece of equipment was a line-throwing gun called a Lyle gun (below, left). Actually a small cannon, the Lyle gun shot a weighted line from the shore to the ship (below, right).





Definitions (continued)

A Coston light was an early type of flare used to signal at night.

The crests of waves are their ridges, or their highest peaks.

To be assigned domestic duties was to work with the supplying, servicing, and arranging of households, or in this case, a place where people not only lived but also worked.

In this case, an eye is the relatively calm and often clear center part of a hurricane. The storm system of the hurricane wraps around the eye.

In this case, men were appointed as favors, or because of favoritism, not because of ability or talent.

A federal government is a central government that controls and coordinates the actions of several smaller but independent governments. In the present-day United States, for example, the federal government in Washington, D.C., oversees the governments of the fifty states.

The shallow, shifting waters beyond North Carolina's Outer Banks have helped wreck or lose large numbers of ships and crew members over the years. Because so many ships and men have been "buried" there, sailors have long called the area the Graveyard of the Atlantic.

The Great Lakes are a connected chain of lakes in the north-central part of the United States, along the border with Canada. The five lakes

When wrecks occurred in deeper waters where waves and winds caused too much movement or when they were farther from shore beyond the Lyle gun's reach, the surfmen used rescue boats instead. The boats commonly used in North Carolina were called surfboats (top, left and above). The boats were stored in the station with all other equipment and were moved when needed on wheeled carts (above). Actually, all the surfmen's rescue equipment was moved on wheeled carts (as in this modern-day demonstration, center) that had to be pushed and pulled through loose, wet sand at the peak of a storm—and not always by horses or mules! In 1915, the USLSS was incorporated into the United States Coast Guard. Since then, many changes have taken place in the shipping industry and with rescue techniques. One of the greatest changes in rescue techniques was the introduction of the helicopter (above). How many changes can you think of that may have been caused by helicopters?

In 1915, the USLSS was incorporated into the United States Coast Guard. Since then, many, many changes have taken place—improvements in ship designs, innovations in fuels and engines, the expansion of flight, the introduction of radio communications and radar, and advances in weather prediction.

These changes have caused a decline in the numbers of rescues needed in coastal waters. Even in our own Graveyard of the Atlantic, we rarely hear of shipwrecks and drowning crews, anymore.

Definitions (continued)

are Superior, Michigan, Huron, Erie, and Ontario.

Hazards are conditions that work against success or safety. The primary hazard at sea was sudden storms that were full of lightning, wind, and rain. But sailors also had to worry about capsizing or sinking because of sudden, dense fogs and hitting slightly submerged objects.

A hurricane is officially classified as a windstorm (or a cyclone). But unlike tornadoes, another kind of windstorm, most of the damage and death associated with hurricanes is not caused by their steady winds. Instead, nine out of ten people die by drowning in flash floods that are created by wind-driven tides (called storm surges) and torrential rains. Hurricane strength is rated on the five categories of the Saffir-Simpson Hurricane Scale.

The person in charge at a USLSS station was the keeper. He was basically responsible for managing the station, training crew members, leading rescue attempts, and recording events.

When a hurricane makes landfall, it has started to move over land.

Saving victims of our natural disaster: The Pea Island Life-Saving Station

by Katie Burkart, former THJHA member

In the early years of the United States Life-Saving Service (USLSS), most stations were poorly staffed and badly equipped. Many men were appointed to crews as favors, not because they were qualified. Many did not even know a ship's bow from its stern. And some would not perform their duties even when they could. In addition, crew members were almost always white.

Although African Americans were often the best local watermen, they were almost always hired on a temporary basis and were assigned to the lowest ranks or to domestic roles such as cooks. Few became surfmen, and none was ever given a high-ranking position in a crew or made keeper of a station. None, that is, until the Pea Island Life-Saving Station became all-black.

The first African American keeper and crew

The incident that caused the crew at Pea Island to be replaced with an all-black crew was the shipwreck of the *M & E Henderson* on November 30, 1879. While this wreck remains shrouded in mystery, the accident created enough suspicion to bring the crew of Pea Island under investigation.

Among other charges, investigators decided that the surfman on duty had not kept a good lookout for vessels in distress, "the neglect of the most important duty of a patrolman," wrote the inspector. In addition, another surfman was found to be physically incapable of performing some of the duties required of a lifesaver. These two men were dismissed.

The keeper of the station was also found to be negligent in his job. Inspectors found that he had lied about bringing the station's medicine chest to the wreck site. He was dismissed, as well. To act as the new keeper of Pea Island, the lead investigator recommended in his

report "Richard Etheridge, colored. . . . Thirty-eight years of age, [of] strong robust physique, intelligent, and able to read and write sufficiently well to keep the journal of the station."

Getting ready for natural disaster

When Etheridge was appointed keeper of the station at Pea Island, the white crew members left. They were outraged at the prospect of serving under a black man. Therefore, Etheridge was allowed to choose whoever he felt possessed the qualities of a lifesaver. Some of the six men he chose were already surfmen in the USLSS. Others were experienced fishermen or oystermen who were very familiar with the waters off the coast.

All the new crew did during its early, winter months was drill, drill, drill. They did boat drills, equipment drills, "reviving the drowned" drills, and other drills. Etheridge made sure all the crew could recite drill rules by memory. He tested the crew by rowdily arousing them in the middle of the night and making them practice and recite.

Although the Pea Island crew experienced racial prejudice because they were black, their abilities in lifesaving and rescuing were proven often. Many ships ran aground near Pea Island, and the crew was often called to assist in other rescues. Their most famous and dramatic rescue occurred October 11, 1896—the wreck of the *E. S. Newman.*

The *Newman,* a 393-ton schooner, was caught in a storm on its way from Providence, Rhode Island, to Norfolk, Virginia. Out in the open sea, where it had no protection, the ship was ruthlessly pounded by rough waves, smashed by heavy seas, and mercilessly lashed by fierce winds. Finally, with a loud rip, the wind stripped off the ship's sails and knocked down its masts.

Winds drove the huge ship almost one hundred miles off course into the **Graveyard of the Atlantic.** The captain, S. A. Gardiner, decided to risk beaching the *Newman* because he was afraid the unrelenting elements would destroy the ship, which carried not only himself and his six-man crew but also his wife and three-year-old child. He fired a flare into the sky and prayed that someone would see it.

A very daring rescue . . .

Someone did. Almost two miles north of where the *Newman* was floundering, regular beach patrols had been suspended because of the bad weather. Instead, Etheridge had sent one of his surfmen, Theodore Meekins, to the lookout tower to keep watch for distress signals. About halfway through his watch, Meekins spotted Gardiner's distress signal. Meekins lit a bright red Coston light so that the storm's victims could see that help was on the way.

Meekins shouted for Etheridge, who joined him in the tower. They saw an answering red flare from Gardiner and rushed into the storm with the crew, their equipment, and a pair of mules.

"It seemed impossible under the circumstances to render any assistance," Etheridge later wrote in his log. "The storm was raging fearfully, the waves [were] sweeping across the beach, and the team was often brought to a standstill by the sweeping current."

Upon reaching the scene, Etheridge saw no way that they could use their standard equipment. The Lyle gun, their most efficient piece of equipment, required gunpowder. But on the way to the wreck—through three miles of wind, rain, and surf—the powder had gotten wet. On top of that, the storm was so fierce that they could not use a boat.

The lifesavers could see the *Newman.* Its masts were down, its sails were gone, and a tremendous crack was beginning to form down its hull. They could hear cries from the frightened victims. Time was precious, and if Etheridge did not think of something quickly, nine lives could be lost.

. . . but a successful one

Suddenly, Etheridge looked at his surfmen and ordered two of them to tie a rope around themselves and go out to "as near the side of the vessel as possible." The men did not hesitate. They trusted their keeper and would sacrifice themselves to save others if that was what they had to do.

The two surfmen moved into the **breakers,** struggling through the crashing waves, wading as far as possible, then diving over the waves and through the storm currents. At last, they reached the side of the ship and secured a line to it. They made ten trips before the *Newman* cracked completely and was dashed to pieces. But, in those ten trips, all aboard were saved.

After the accident, Gardiner felt that the men should have some type of reward. So for hours and hours, he searched the beach. Finally, he found what he wanted. The reward was not gold or bronze, and it held only one name: *E. S. Newman.* It was the ship's nameplate, part of the ship that had washed ashore.

After saving the passengers and crew of the E. S. Newman *in October 1896 (below), the seven rescuers from the Pea Island USLSS station received a heartfelt award from the captain—the ship's nameplate (left). That was all the recognition they received until March 1996, when the men were finally awarded gold lifesaving medals.*

Definitions (continued)

The leeward side of something is the side away from the wind. The windward side is the side that faces the wind.

In this case, a line is a rope. Ropes were "thrown" from rescuers on the beach to the crews of ships by a line-throwing gun. These guns were actually mortars, or small cannons, that used gunpowder and a weighted projectile to carry a rope to a ship.

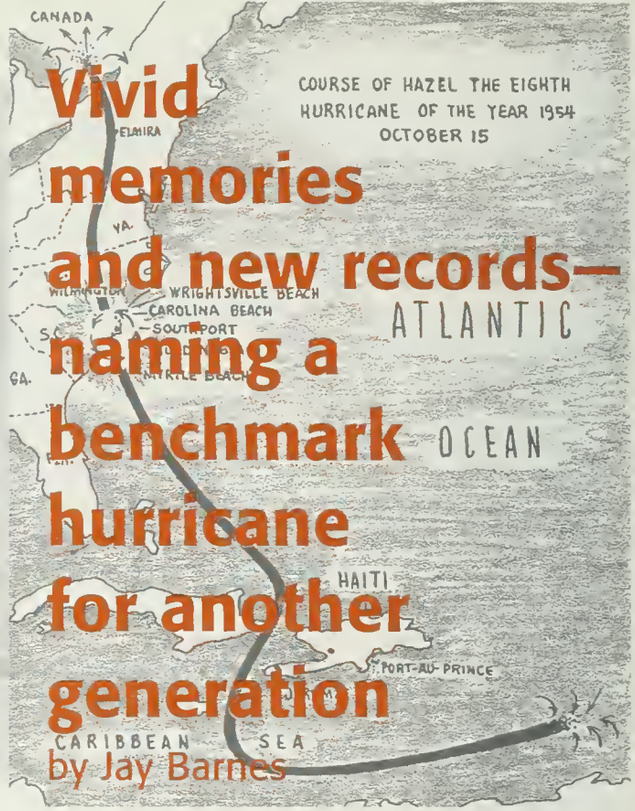
David A. Lyle began improving on line-throwing guns in the 1870s. By the turn

During the spring of 1995, Katie Burkart, then a junior historian from Washington, North Carolina, entered an essay (from which much of the article on page 6 and this sidebar are taken) in competition at the THJHA annual convention. Her essay, "Forgotten Legacy: African American Storm Warriors," quickly became a final and important part of the movement to get posthumous honors for the forgotten African American crewmen of the Pea Island USLSS Station. On March 5, 1996—almost one hundred years after the E. S. Newman *rescue—Katie attended a ceremony at the Navy Memorial in Washington, D.C. There, the Pea Island lifesavers were finally awarded gold lifesaving medals for their acts of bravery and sacrifice. In recognition of her contributions, Katie later received an Award of Merit from the American Association for State and Local History. Katie is currently a junior in high school.*

"Rescues from the Newman," *by Roy LaGrone, is part of the United States Coast Guard Art Collection and is reproduced courtesy of* Coast Guard Historian *magazine with assistance from Edward Kruska. "Helicopter rescue of the* Oriental, *December 1969," (a photo by Aycock Brown) is used courtesy of the Outer Banks History Center in Manteo. "Stranded ship near Hatteras" and "Wreckage from the* Priscilla *at Gull Shoal" are used courtesy of the North Carolina Collection at the University of North Carolina at Chapel Hill. The photo of the* E. S. Newman *nameplate and the photo of a wheeled cart demonstration at the Chicamacomico USLSS station in Rodanthe are provided courtesy of the author. "Waves breaking at New Bern, early 1900s" and "USLSS surfboat" are from the North Carolina Division of Archives and History. The Lyle gun is from collections at the Museum of History. "USLSS in action" is from* Harper's Weekly. *"Firing the Lyle gun" and "Surfboat on cart" are copied from the June 1879 issue of* Popular Science Monthly.

Vivid memories and new records—naming a benchmark hurricane for another generation

by Jay Barnes



Their honeymoon in Long Beach started out with beautiful weather. But in mid-October 1954, Connie and Jerry Helms, as well as citizens from four other nations, met a hurricane named Hazel. Hazel quickly replaced the Helmses' plans for vacation with a struggle for life. Hurricane Hazel, a category 4 storm, left much of North Carolina's southern coast in ruins (below, left) as it passed from the Caribbean to Canada (above).

October 5, 1954 . . . A small storm is identified just east of Grenada. Winds are clocked at 95 mph.

October 12, 1954 . . . Now named Hazel, the growing storm gathers strength over the Caribbean Sea before slamming into Haiti. Wind speeds have increased to around 125 mph. A torrential rain floods rivers, washes out roads, and fills homes with mud. Almost all of the 260 Haitians in Berley, a mountain village, are buried in a massive landslide.

October 15, 1954 . . . At 8:00 in the morning, the eye of Hurricane Hazel passes about ninety-five miles east of Charleston, South Carolina. Less than two hours later, the storm makes landfall very near the North Carolina–South Carolina border.

Hazel comes to town

The south-facing beaches of Brunswick County, North Carolina, caught the brunt of Hurricane Hazel's fury. Robinson Beach, Ocean Isle, Holden Beach, and Long Beach were hardest hit. Virtually every home or structure was washed away or severely damaged. In most cases, oceanfront cottages were first battered by waves and 150 mph winds, then swept off their foundations and tossed several hundred yards into marsh thickets.

"Of the 357 buildings which existed on Long Beach, 352 were totally destroyed and the other five damaged," read a report issued by the National Weather Service office in Raleigh. "The greater part of the material from which the houses had been built was washed . . . into the edge of low-lying woods," it continued. "Some of this material is identifiable as having been parts of houses, but the greater portion of it is ground to unrecognizable splinters and bits of masonry."

Those unlucky souls who were caught in Hazel's rapidly rising storm tides either rode out the upheaval of their homes or perished in the ordeal. The Southport newspaper, the *State Port Pilot,* reported the story of two survivors who endured the worst of the storm: Connie and Jerry Helms.

Waking up to a pounding surf

Connie and Jerry Helms were in Long Beach for their honeymoon and had gone roller-skating the night before Hazel struck. The Coast Guard had warned residents of the hurricane's approach, but the newlyweds arrived back at the beach too late to hear the warnings. They went to bed with no knowledge of the ominous storm poised off the coast.

At dawn the next morning, the Helmses awoke to the sound of pounding surf and chairs blowing about their porch. Huge waves began

Definitions (continued)

of the 1900s, the most popular type of line-throwing device had become the Lyle gun. Lyle guns remained in production into the 1950s.

Maritime is a word used to describe a connection with the sea.

In this case, a mast is the pole on a ship that holds a sail. Ships with masts that were powered by the wind were common until the 1920s.

Meteorologists are people who study the science of weather conditions and forecasting.

A disaster is a sudden and unexpected event, misfortune, or mishap that causes pain, hardship, and ruin to a community of people. A natural disaster is a natural event with a natural cause that leads to disaster. Natural disasters can include hurricanes, tornadoes, blizzards, droughts, epidemics, and plant blights, to name a few.

The Outer Banks is the name given to the barrier islands that lie along North Carolina's coast.

In this case, to take refuge is to find shelter in a safe or protected place.

Shoals are shallow areas.

In this case, a sound is the body of water that lies

Hurricane Hazel was one of North Carolina's strongest recorded hurricanes, so the storm naturally became a benchmark in the minds of residents who were here at the time. Just about any time hurricanes became the topic of discussion, stories about Hazel were sure to follow. That is, until the damage of Hurricane Fran was seen in September 1996. Since then, whenever people talk about hurricanes, most recall stories of Fran. Fran became the benchmark for a new generation of Tar Heels.

crashing over the dunes as the couple scrambled to leave their cottage. With no time even to pack their clothes, they jumped into their car, but it would not start. They ran to their jeep, but it would not start either.

By this time, ocean water was waist deep in the street, and Connie and Jerry knew it was becoming deeper and rougher by the minute. They made their way to a nearby two-story house and went inside. As the tides continued to rise, the second floor buckled and the couple feared they might perish if the house collapsed.

"We started seeing houses . . . floating away," Jerry remembered. "There was a little cinder-block house next door . . . a **breaker** went over top of the house, and after . . . it was gone. . . . We saw a guy standing in the doorway of another house floating by. He was found the next day buried in the sand."

The couple watched as the entire island went under water and every house within sight was swept away or pounded to splinters by massive waves. Large timbers, roof sections, and appliances of every kind whisked past the cottage where they had taken **refuge.** As water swirled just inches below the second-story windows, the Helmses knew that their shelter was about to give in to the storm's waves and winds.

Tying themselves together with a flannel blanket, the newlyweds escaped the collapsing house through a high window. Connie, who could not swim, climbed onto a cotton mattress while her husband jumped into the raging waters.

Saved by a blanket

"By that time, all the two-story houses were covered by water, and most of the other stuff was already gone," Jerry recalled. "But we never had a chance to think about what was happening or be scared. We were just trying to hold on to that blanket and stay alive."

The currents carried the couple toward the **leeward** side of the island. To stabilize their makeshift raft, Jerry grabbed a section of a house that was drifting by and positioned their mattress on top of it. A short time later, their raft became lodged in some treetops near Davis Canal. There, the couple endured the storm for several more hours.

"It got real calm when the eye passed over, and then it started raining real hard. It felt like little bullets," Jerry said. "There was a lot of times we thought we were gone."

When the hurricane winds subsided and the floodwaters began to recede, the Helmses climbed down from the treetops and made their way across Davis Canal—still clutching the blanket that had helped save their lives. Later that night they went back to their home in Whiteville.

The following day, they returned to Long Beach to search for the remains of the car, the jeep, and the cottage. Both vehicles were buried deep in the sand, and the only remaining fragment of the house was one corner, held in place by a single post. About a mile up the beach, the refrigerator was found, still intact, with its door sealed.

Definitions (continued)

between North Carolina's barrier islands, or the Outer Banks, and the mainland.

The **stern** *of a boat or ship is the rear part, the back.*

In most hurricanes, the **storm surge** *is the deadly part of the event. Storm surges are temporary rises in sea level basically caused by the storm pushing down on the ocean surface. (This rise is similar to what happens when you push your finger down into a glass of water—the level of the water rises around the edge of the glass just as the level of the ocean rises along the coast.) Heights of storm surges can range from four to more than eighteen feet. Storm surges usually start arriving at least a day before a hurricane and reach their peak height shortly before the storm makes landfall. In addition to the surges, pounding waves driven by high winds and the regular high tides of an area can push water levels even higher. Surges can also raise water levels on local sounds and rivers.*

The **storm track** *is the path of the hurricane. Storm tracks have two parts during the life of a hurricane: the historical track (where the storm has already hit) and the predicted track (where meteorologists expect it may go).*

The crew members at a USLSS station were called **surfmen.** *They were basically responsible for maintaining the station and its equipment, learning rescue techniques, keeping watch or patrolling beaches, and, of course, carrying out rescue attempts.*

Ocean **swells** *are long, relatively low waves (or an unbroken series of such waves) that have a rhythm caused by the natural heaving and rolling action of the tides.*

Technically, a **tsunami** *is not a "tidal wave"—the tides and currents of the oceans*

Definitions (continued)

have nothing to do with its formation or growth (though the Japanese thought so when they named the waves centuries ago). We now know the most common causes of tsunamis are undersea disturbances such as earthquakes and volcanic explosions. These disturbances cause vibrations that form concentric rings (similar to the rippling rings that are made when a stone hits the surface of a pond). The rings eventually develop into the towering walls of seawater that are known as tsunamis.

Watermen are men, often fishermen or pilots, who are familiar with the tides, currents, and obstacles of local waters.

According to Jerry, "The drinks in the refrigerator were still cold and the only thing broken was a bowl of peas, so we sat down and ate lunch out of it." The honeymoon was over for the Helmses, but their incredible struggle for survival was not soon forgotten.

A storm to remember

Hazel was a storm the Tar Heel State would remember for years to come—it was one for the record books. The **storm surge** that Hazel delivered to the state's southern beaches was the greatest in North Carolina's recorded history. The southern coastal areas where Hazel made landfall were also battered by some of the most destructive winds on record. And, on the western side of the **storm track**, many places in the Piedmont established new twenty-four-hour records for rainfall.

Hurricane Hazel became a **benchmark** in the lives of the North Carolinians who endured the 1954 storm. This benchmark remained until 1996, when Hurricane Fran became a new benchmark for younger generations and recent immigrants to the state. Fortunately, natural disasters of these magnitudes are relatively rare events.

Nor'easters, which are also sometimes called "winter hurricanes" and "Hatteras lows," are strong, slowly rotating weather systems just like hurricanes. The largest difference is that a nor'easter (formally known as a "northeasterly") does not have a central eye. Damages from the winds and storm surges of nor'easters are very similar to damages caused by hurricanes. The Ash Wednesday Storm of March 7, 8, and 9, 1962, proved especially damaging to the northern Outer Banks. In addition to the winds and floods of the nor'easter, the weight of three inches of wet snow snapped many telephone poles and closed roads—cutting off electricity, communications, and transportation between the area and the rest of the state.

Jay Barnes is director of the North Carolina Aquarium at Pine Knoll Shores in Atlantic Beach. He researches past hurricanes with the hope that understanding their history will help us better prepare for future hurricanes. He recently finished revising his book North Carolina's Hurricane History *(University of North Carolina Press, 1998). This article is condensed from that book and used with permission of the publisher.*

The photos of trees demolishing a house and a car are provided by Marianne and Tom Wason (the car was not theirs). "Couple on the beach" is from the North Carolina Division of Archives and History. The house on the beach is provided courtesy of Carolina Power and Light (CP&L) with assistance from J. W. Photo Labs in Raleigh. The two photos of the Ash Wednesday Storm are used with permission of the Outer Banks History Center in Manteo and assistance from the Museum of the Albemarle in Elizabeth City. "Course of Hazel" and "Hazel and the Kure Beach pier" are reproduced from Hurricane Hazel Lashes Coastal Carolinas, *published by Art Newton, the Wilmington Printing Company, and the Wilmington* Star-News. *Both illustrations are used with permission of the* Star-News *and assistance from the Cape Fear Museum in Wilmington.*

Not just another wave

North Carolina has never experienced a major tsunami (pronounced "tsue-nah-me")—at least not in recorded history. But because some its lands meet with an ocean, the chance of having one does exist. Scientific models, in fact, show that a sizable tsunami in the Atlantic Ocean could wash as far inland as the Appalachian Mountains.

"They are watery creatures"

According to *Savage Earth,* a series of programs aired by the Public Broadcasting Service, in the deep waters of the open ocean, tsunami waves approach speeds of 500 mph, but they "spread out and hunch down, with hundreds of miles between crests that may be just a few feet high." On the surface, they look no different than wind-driven waves or tidal waves, or swells, and they feel no different to people on boats or ships.

But, while they may not be different on the surface, they have big differences underneath. "Though wind-driven waves and swells are confined to a shallow layer near the ocean surface, a tsunami extends thousands of feet deep into the ocean.

"Tsunami waves usually do not curve over and break, like Hawaiian surf waves. Survivors of tsunami[s] describe them as dark 'walls' of water. . . . The waves bulldoze onto . . . shore and inundate the coast, snapping trees like twigs, toppling stone walls and lighthouses, and smashing houses and buildings into kindling."

Should we start worrying?

Fortunately, the chance of a tsunami washing over North Carolina is not likely. Why? The same shallow waters that have earned our Outer Banks the nickname "Graveyard of the Atlantic" would, in this case, protect us. As soon as a tsunami wave began to reach the shallow waters east of the Outer Banks, it would start slowing down and increasing in height. By the time an average-sized wave actually made landfall, scientists believe, it would probably have already reached its peak. In that case, the weakening tsunami would most likely affect only the banks and sound areas.

The weather, the media, and a natural disaster

by Chris Hohmann

On Saturday, September 8, 1900, Isaac Cline took his first weather observations of the day in the island city of Galveston, Texas. Skies were partly sunny, but the **barometer** had fallen slightly overnight, and some heavy swells were rolling in from the Gulf of Mexico. Cline was chief of the United States Weather Bureau office in Galveston. For several days he had been watching the skies for signs of a major hurricane that had slammed into the Florida Keys and moved into the gulf.

As the winds increased that morning, Cline feared that Galveston was going to suffer a direct hit. He rode his horse up and down the beach, warning residents to head for higher ground, or better yet, to flee the island for the mainland. Some heeded his warnings, but many more ignored him. After all, they thought, Galveston had suffered its share of hurricanes, but none had ever brought significant damage.

We no longer rely on watching the sky

Galveston's charmed past with hurricanes unfortunately ended that night. The storm crashed into the island with **sustained** winds of 120 mph and torrential rains. The **storm surge** flooded nearly the entire island.

When the hurricane was over the next morning, the almost complete destruction of Galveston assaulted the eyes of survivors. Thousands of buildings were submerged or had been swept out to sea. The loss in human life was almost unimaginable: at least 6,000 people had died in the storm, including Cline's wife, Cora May. To this day, the Galveston Hurricane of 1900 remains the single worst **natural disaster** in United States history.

But much has changed in the years since Galveston's hurricane. The residents of Galveston had only Cline's hunch, an educated guess, that a storm was approaching them. They had no way of knowing the storm's size or strength, location, or direction. And besides, Cline had no way of advising residents or tourists who could not hear his shouted warnings.

Today, **meteorologists** rely on a wide variety of modern **meteorological** equipment—radars and satellites, radio and television, and computers and the Internet—to provide many different kinds of weather information. Computerized weather stations in local communities constantly monitor temperature, wind speed and direction, and rainfall. Additional computer systems gather

In August 1899, just over a year before the hurricane of September 1900 destroyed Galveston, Texas, a very damaging hurricane struck the northern Outer Banks of North Carolina. Though hurricanes were not normally named until the 1950s, this storm was known as San Ciriaco in the national press and as the Great Hurricane of 1899 or the Old August Storm of 1899 by locals. Because the National Weather Service station (right) was so badly hit during the hurricane, many measurements could not be made and some records were lost. Still, a few modern-day researchers believe this storm could have been North Carolina's only category 5 hurricane. S. L. Dosher was the "Weather Bureau observer" on Hatteras Island at the time. He wrote, "The entire island was covered with water, and by 11 a.m. all the land was covered to a depth of from 3 to 10 feet. [The] tide swept over the land at a fearful rate, carrying everything movable before it. Nearly every house on the place was flooded, and in many cases houses were so badly wrecked as to be worthless . . . everything along the water front was swept away. . . . The oldest inhabitants here—and there are those who can remember back for a period of 75 years—say that no such storm has ever been known here." Nags Head (above) was only one of the towns to suffer damages. Two towns were completely erased. "Large live oaks, which have probably withstood the storms of centuries, were uprooted like corn-stalks, and houses which have stood the storms and tides of over 50 years were wrecked and ruined."

Definitions, pages 13–17

Bacteria are microscopic organisms that can live in soil, water, plants, and animals. While some bacteria are sometimes helpful, others can cause diseases that are harmful.

A barometer is a weather instrument used to measure atmospheric pressure. At one time, barometers were one of the primary tools for predicting weather.

A blight is a plant disease.

The boll of a cotton plant is the pod, or the part that contains the fiber and seeds.

A category 3 hurricane is a "typical" hurricane for North Carolina. Category 3 is the middle of the five ratings that categorize the strength of hurricanes on the Saffir-Simpson Hurricane Scale. Category 3 hurricanes have 111 to 130 mph wind speeds and a 9- to 12-foot storm surge. Officials may order evacuation of areas on the Outer Banks as well as low-lying areas inland.

When a hurricane loses strength and wind speed, it is downgraded, or lowered in category on the Saffir-Simpson Hurricane Scale. Once winds become lower than 74 mph, a category 1 hurricane is downgraded to a tropical storm.

Eradication is another word for elimination, especially of insect pests and plant diseases.

As opposed to expected, predicted floods that are

Definitions (continued)

caused by day after day of hard rain, flash floods are very local and contained floods that usually happen quickly.

Wind gusts are sudden and short increases in wind strength.

To be immune is to have complete freedom or protection from a threat.

"The bugs are not the problem, bug infestation is." While individual insects or even small numbers of them can sometimes be controlled, once they reach large populations, their spread and impact are virtually unstoppable.

Insecticides are substances that kill or repel insects.

The Florida Keys are the small islands off the southern coast of that state.

When a hurricane makes landfall, it has started to move over land.

Meteorologists are people who study the science of weather conditions and forecasting. Meteorological tools and equipment help them gather data and make educated predictions.

Mobile is another word for movable.

A disaster is a sudden and unexpected event, misfortune, or mishap that causes pain, hardship, and ruin to a community of people. A natural disaster is a natural event with a natural cause that leads to disaster. Natural disasters can include hurricanes, tornadoes, blizzards, droughts, epidemics, and plant blights, to name a few.

The Outer Banks is the name given to the barrier islands that lie along North Carolina's coast.

In this case, pests are destructive insects.

radar data and satellite images from around North Carolina, the South, the United States, and other parts of the world. Another system can activate and broadcast warnings automatically, the instant a weather alert is issued.

In August 1998, the latest meteorological technology tracked Hurricane Bonnie across the Atlantic Ocean for a week before the storm struck North Carolina. Television audiences watched as the storm traveled, gained strength, damaged areas to the south, lost strength, and then changed course at the last minute. Few people were surprised when the storm slammed into the coast with 100 mph winds.

Alerting the public to dangerous possibilities

Bonnie formed in the Atlantic Ocean on Thursday, August 20. Far out to sea, the storm was only a small part of our weathercasts at NewsChannel 11, WTVD-TV, in the Triangle. We—the station's meteorologists—thought Bonnie would not be a threat to North Carolina for at least a week, if ever.

At the turn of the century, weather observers had few instruments and little equipment to help them understand current weather conditions. How could they possibly foretell conditions in the future? And besides, how could they have advised people of threatening or dangerous conditions, anyway? Today's meteorologists can rely on a wide variety of modern scientific equipment—finely tuned instruments, satellites, radars, and computers—to see, track, and predict a variety of natural disasters. They can advise us about hurricanes (next page, right) and thunderstorms (next page, left), snow and ice storms, and even droughts, to name a very few. They also have a variety of ways of communicating their information—newspapers, radio, television (above), telephones, and the Internet.

Bugs and blights

by Valerie J. Howell

Though flooding, drought, high winds, and hail are common natural disasters for farmers, insect pests such as the boll weevil (left and right) and plant diseases such as the Granville wilt also cause much damage. Boll weevils damage cotton plants and reduce cotton harvests. They use their long snouts to place eggs deep into developing cotton bolls. After these eggs hatch in two or three days, young weevils feed on the developing fibers in the cotton boll. In fifteen to nineteen days, adult weevils emerge, and a new generation can begin its attack. Weevil populations can more than double every week. Many plant diseases spread more quickly than that. To slow the progress of these threats to livestock and crops, scientists and researchers help farmers track infestations and infections and promote new farming methods and scientific discoveries.

When we hear the term "natural disaster," most of us think of weather-related events such as hurricanes, tornadoes, droughts, or floods. To a farmer, though, the term can also include events caused by insects and diseases that affect, even destroy, crops and livestock.

The boll weevil, king of the insect pests?

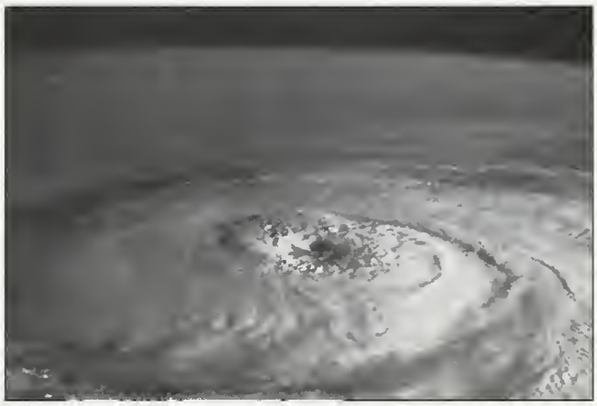
In 1892, an insect known as the boll weevil entered the United States near Brownsville, Texas. Called "the most economically significant of all insect pests to cotton," the boll weevil has since caused more than $12,000,000,000 in losses to the United States cotton industry. Boll weevils reached North Carolina between 1919 and 1921.

What is the big deal with this little bug? Boll weevil infestation ruins cotton crops and reduces production. Adult weevils place their eggs into an unripened cotton boll. Once the eggs hatch, the young weevils eat their way through the boll. Since the boll is damaged, it produces less cotton, and the farmer ends up with less of the product to sell.

Poisons became the early method of boll weevil control. In fact, by 1973, about one-third of all insecticides that farmers applied to agricultural crops in the United States were used to control boll weevil infestation. Unfortunately, the cost of purchasing these insecticides increased the cost of growing cotton. In addition, some people questioned the effects of insecticide chemicals on the environment.

Fighting these natural disasters

In 1977, a new eradication program began in parts of North Carolina and Virginia. The test program used traps that were placed around cotton fields and then checked every week. These traps contained a small amount of insecticide that killed the trapped weevils—no chemicals needed to be sprayed over fields.



The next day, though, computer forecasts were beginning to hint that Bonnie might affect North Carolina as early as Tuesday. The weather department, the StormCenter, at NewsChannel 11 kept a wary eye toward the ocean.

Over the weekend, Bonnie developed into a **category** 3 hurricane with 115 mph winds. The storm approached the Bahamas, curved northwest, and was getting closer to the United States. We now felt more certain that Bonnie would be visiting the Tar Heel coast. Bonnie suddenly became the lead story in our weekend newscasts. Besides providing updates on the storm's position, direction, and strength, we broadcast reports from a small, **mobile** news crew on the coast.

On Monday, August 24, the National Hurricane Center in Miami, Florida, issued a hurricane **watch** for much of the eastern coast. Bonnie was still several hundred miles from the coast, but it was heading our way.

Definitions (continued)

Preempt is another word for interrupt.

*In this case, **production** is the amount of farm goods that are raised for sale to provide income for farmers.*

*To be **resistant** is to be able to withstand or repel a certain level of exposure to a threat.*

*In most hurricanes, the **storm surge** is the deadly part of the event. Storm surges are temporary rises in sea level basically caused by the storm pushing down on the ocean surface. (This rise is similar to what happens when you push your finger down into a glass of water—the level of the water rises around the edge of the glass just as the level of the ocean rises along the coast.) Heights of storm surges can range from four to more than eighteen feet. Storm surges usually start arriving at least a day before a hurricane and reach their peak height shortly before the storm makes landfall.*

After three years, farmers in these areas, along with the United States Department of Agriculture, which coordinated and helped farmers pay for this program, claimed success. In November 1997, only 153 boll weevils appeared in all the Tar Heel State. Those 153 pests were limited to a single farm in Pender County and were found to have hitchhiked on a truck from Texas the year before. "Open spraying" is now used only in fields when the weevil population grows out of hand.

By continuing to use a combination of up-to-date farming practices, new varieties of pest-**resistant** plants, naturally occurring beneficial insects, controlled chemical use, and quick response to problem areas, American cotton farmers expect to completely eliminate the boll weevil by the year 2002.

But farmers will still face other natural disasters, other pests, other diseases. As boll weevil infestation becomes less of a threat, infestation by bollworms, European corn borers, fall armyworms, stinkbugs, cotton aphids, and thrips—especially if they become resistant to currently used pesticides or if farmers fail to keep them in control—could be the cause of future natural disasters. Diseases such as hog cholera, hoof-and-mouth disease, the Granville wilt, black shank, and mosaic are also threats to North Carolina farmers.

A disease threatens tobacco

In 1880, a plant disease that came to be called the Granville wilt appeared in Granville County (and present-day Vance County). During the next thirty years, this **blight** caused some farmers to lose all of their tobacco crops. In the hardest-hit areas, banks closed, farms were sold, and towns declined.

The Granville wilt spread gradually. It first spread to Wake and Durham Counties. Today it affects all tobacco-growing areas in North Carolina. The disease occurs when specific **bacteria** infect the plants. The bacteria usually spread by contact through infected transplants, contaminated water, or vehicles that move from field to field.

The first sign of infection appears when a plant begins to **wilt** on one side. Eventually, the entire plant wilts and usually dies. If the plant does not die, it is stunted, and the leaves are distorted. Distorted leaves do not sell for as high a price as healthy ones, so the farmer makes less money. Granville wilt bacteria can also infect tomatoes, Irish potatoes, peppers, peanuts, and eggplants.

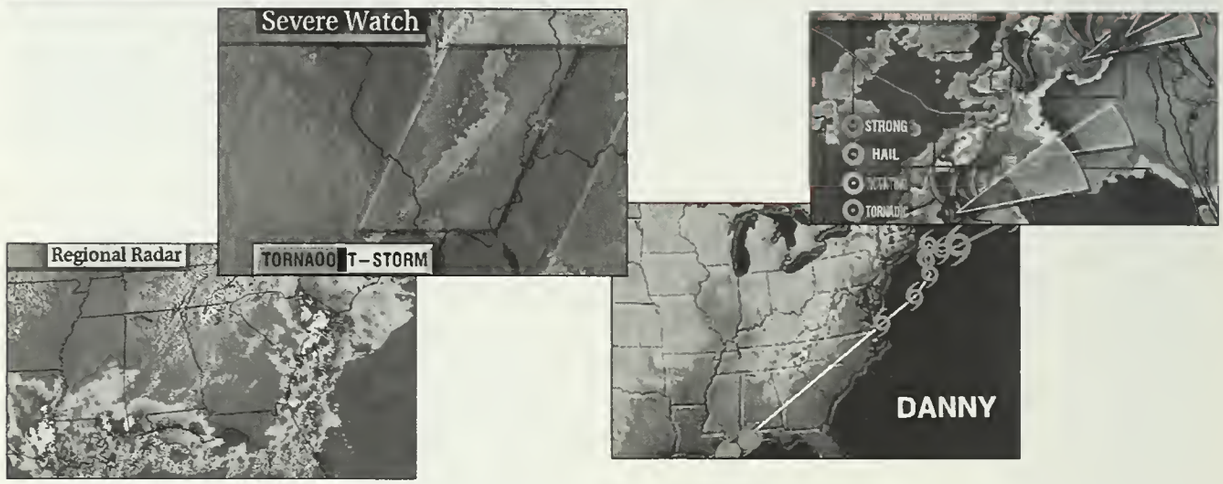
The Oxford Tobacco Research Station in Granville County began various research programs to fight this blight in 1911. Researchers found that crop rotation was essential to controlling the Granville wilt. Also important is the complete destruction of tobacco stalks and roots after harvesting. This reduces the chance that the disease will survive until the next season.

In 1944, E. G. Moss of the research station developed a new wilt-resistant variety of tobacco. Though they are not wilt-immune, these plants can survive and grow in infected areas, allowing present-day farmers to continue fighting these types of natural disasters.

Valerie J. Howell was a member of a THJHA club when she was in high school. She later worked with the THJHA program during her ten years with the Museum of History. She now works at the Johnston County Heritage Center in Smithfield. Her interests also include tobacco history and farm life in the 1800s.

Both photos of boll weevils are provided courtesy of the Boll Weevil Eradication Program, Plant Industry Division, North Carolina Department of Agriculture and Consumer Services.

The latest in meteorological equipment includes satellites (left, top), different types of radar, and weather computers. Used together, this equipment can enable today's meteorologists to identify weather systems (left, bottom), identify severe thunderstorms and tornadoes (left, center), and predict the tracks of hurricanes (below, bottom) and tracks of storm fronts (below, top). They may not be able to identify, predict, or eliminate all natural disasters, but they can help people to prepare for, deal with, and recover from most of them.



Definitions (continued)

In addition to the surges, pounding waves driven by high winds and the regular high tides of an area can push water levels even higher. Surges can also raise water levels on local sounds and rivers.

Sustained winds are steady winds that maintain the same speed and direction for many minutes.

Ocean swells are long, relatively low waves (or an unbroken series of such waves) that have a rhythm caused by the natural heaving and rolling action of the tides.

The Triangle is the nickname for the part of North Carolina that contains the three cities of Raleigh, Durham, and Chapel Hill.

The "tropical storm" category is the fourth step in the creation and growth of a hurricane: tropical disturbance, tropical wave, tropical depression, tropical storm, and hurricane. It is also the first step in the death of a hurricane as it begins falling apart.

Utilities are services such as electric, gas, and water

At NewsChannel 11, our coverage kicked into high gear. Not only did we make Bonnie the major story of every newscast, but we also began broadcasting updates every half hour. Meanwhile, our presence on the coast increased, as well. Five crews were now in position from Nags Head to Wilmington.

In the Triangle, reporters were passing along information about evacuation plans and other announcements and activities at the North Carolina Emergency Management office. They also reported how folks in the Triangle were getting ready for the possibilities of damaging wind and rain. By Monday night, we were almost certain that Bonnie would make **landfall** on the North Carolina coast.

Informing during the storm

Bonnie's winds and rains started reaching the North Carolina coast early Wednesday morning. As the wind speeds increased, so did our coverage. The management of the station decided to **preempt** (pronounced "pre-empt") regular programming and to air uninterrupted news coverage of the storm with no commercials. Two reporters anchored this program. They coordinated news from our crews at the coast, updates from me or another meteorologist in the StormCenter, and stories from reporters here in the Triangle.

The full force of Bonnie crashed onshore near Wilmington at about 3:00 Wednesday afternoon. As the storm crawled up the coast, rainfall amounts approached ten inches in some areas, and wind **gusts** neared 100 mph in a few spots. Heavy rains and gusty winds eventually spread into eastern parts of NewsChannel 11's viewing area. Wilson, for example, received four to five inches of rain, which caused some **flash floods**. In the Triangle, rainfall was light, but winds between 30 and 40 mph caused a few inconveniences.

By 11:00 that night, Bonnie had weakened in strength. The storm was **downgraded** and reclassified as a **tropical storm**. Since the weather was calming down a bit and situations in the viewing area were becoming less serious, the station management decided to end its nonstop coverage after the 11:00 news. We had been on the air continuously, without commercials, since 9:00 that morning—14½ hours.

Helping with recovery

After Bonnie moved back to sea, coastal residents emerged from shelters and homes to survey damages. Fortunately, the destruction was less than expected. Trees, signs, and power and telephone lines had been knocked down, but damage to buildings was slight. Actually, most of the damage occurred in fields of crops, where plants had been pounded by torrential rains and flooded by standing water.

Within a few days, life returned to normal for most folks along the coast. Although a couple of news crews stayed in position through

the weekend, news reports related to Bonnie quickly grew shorter and shorter as we reported on the cleanup effort, the restoration of **utilities**, and the condition of the beaches.

In 1996, on the other hand, Hurricane Fran was a much more powerful hurricane, and it caused widespread destruction from the coast to the Triangle. Our coverage, then, was much more intense and, in fact, continued for weeks after the storm. We reported on damages and recovery efforts along the coast and throughout the Piedmont. We followed the mammoth efforts to restore power and communications. We broadcast school and business closings. And we provided tips on how to cope in the storm's aftermath, as well as information about contacting agencies that were offering assistance and relief.

The media and natural disasters

The people of North Carolina are almost constantly threatened by natural disasters—snow and ice storms, floods, tornadoes, hurricanes, and other natural events. Of course, not all of these events become natural disasters. And not all bouts with severe weather deserve the kind of news coverage that the media gave Bonnie or Fran. But whenever storms do threaten, most television stations, radio stations, and other media outlets assume some of the responsibility for keeping folks informed and safe.

In 1900, Isaac Cline had nothing but his voice and his horse to use in spreading the news of an approaching hurricane. He spent hours riding up and down the beach in Galveston to warn a few thousand residents.

Today, through television, radio, and the Internet, I can warn hundreds of thousands of people in only a few moments. Together with the vast assortment of technologically advanced tools I have at NewsChannel 11, I can quickly and easily alert people to almost any natural disaster, keep them informed during dangerous weather, and help them with recovery efforts after the storm. Meteorologists and the media cannot let Galveston happen again.

Definitions (continued)

distribution, sewage disposal, and garbage pickup.

Issuing a weather ***watch*** *is one of the ways that meteorologists and community leaders help make people aware of threatening weather conditions. A hurricane watch, for example, means that a hurricane may threaten a specific area within 36 hours. As conditions become nearer, more threatening, and more certain, a weather warning will be issued. Other potential natural disasters, such as thunderstorms and tornadoes and floods, also have watches and warnings.*

A weevil is a type of beetle.

To wilt is to become limp, or to droop or shrivel.

by Christian Poirier & Stephen Evans
The Olds Report
Surviving a natural disaster . . .
Good day. I am Colonel Fred A. Olds, founder of the North Carolina Museum of History. Today is May 5, 1989, and I am reporting from Forsyth County. I want to find out what to do since a tornado watch has been issued. But, I seem to be in a bit of a w i n d s t o r m !
Hey mister!
Looks like a tornado is coming! You'd better get inside before you get yourself killed!
I believe you're right. Tell me, young man, is the tornado close?
The weatherman said radar had spotted one nearby. He's issued a warning, now.
What? I cannot hear you over that freight train roar!
Come on, mister! We have to get to a ditch or a shelter or inside to a basement or a small, first-floor room with no windows or at le[illegible] under a table or a mattress . . .
Why is that?
Those are the safest places with all this stuff flying around!
Sounds like excellent advice! Point the way .

During the 1880s, Colonel Fred A. Olds was a colorful, energetic man—and one of many voices who felt the state needed a history museum. Olds worked diligently to raise interest in learning North Carolina history and in saving North Carolina artifacts. After joining a group that wanted to start a museum of the state's history in 1900, Olds donated the collection of artifacts he had collected over the years. That collection became the basis of the Hall of History, which Olds helped name, organize, and run after it opened in 1902. Until he retired in 1934, Olds continued to collect artifacts—he visited each county in the state at least three times to do so and ultimately collected almost 30,000 items! Since his death in 1935, the Hall of History has become the North Carolina Museum of History, the sponsor of the Tar Heel Junior Historian Association.

Chris Hohmann has been a meteorologist with NewsChannel 11 in the Triangle since 1991. "Even as a kid, I was interested in the impact that weather had on everybody, everything everyday and how even the smallest changes could have fascinating effects."

The photo of damages at Nags Head following the Great Hurricane of 1899 is used with permission of the Outer Banks History Center in Manteo and assistance from the Museum of the Albemarle in Elizabeth City. The photo of the weather station on Cape Hatteras, taken between 1895 and 1904, is from the North Carolina Division of Archives and History. The "video capture" of meteorologist Chris Hohmann is provided courtesy of WTVD-TV 11. Other information and assistance was provided by Lisa Spencer and WNCN-TV 17 in Raleigh. All other artwork is copied from a catalog released by Weather Services International in Billerica, Massachusetts.

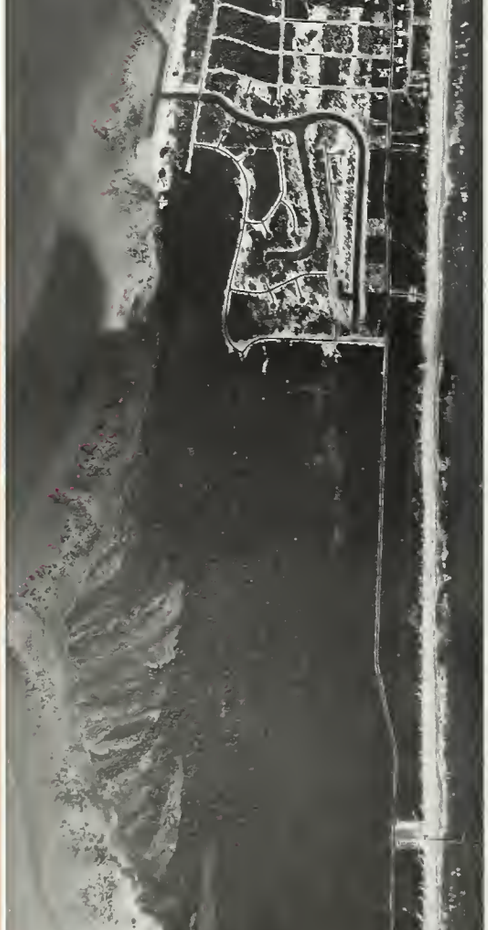
"The Olds Report" was conceived and illustrated by Christian Poirier of Raleigh.

Think about natural disasters: Activities and exercises

Read through these activities and exercises before you read, as you read, or after you read this issue—they are guaranteed to help you understand key concepts and important ideas. You can probably answer the questions on your own, but find a fellow club member to work with if you want. Either way, have fun!

Understanding changing ideas about natural disasters

In the introduction on pages 1 through 5, Brian Averette mentions that, while natural disasters themselves have not changed much over the centuries, some ideas about them have. One of those ideas is impact. At one time in North Carolina history, for instance, the coast was not covered with houses, condominiums, businesses, hotels, or roads or even people—no property to be damaged or people to be hurt. Modern-day natural disasters, however, almost always cause damages and are usually measured in numbers of people killed and dollars of property damaged. These figures are then frequently used as inaccurate comparisons over the years.

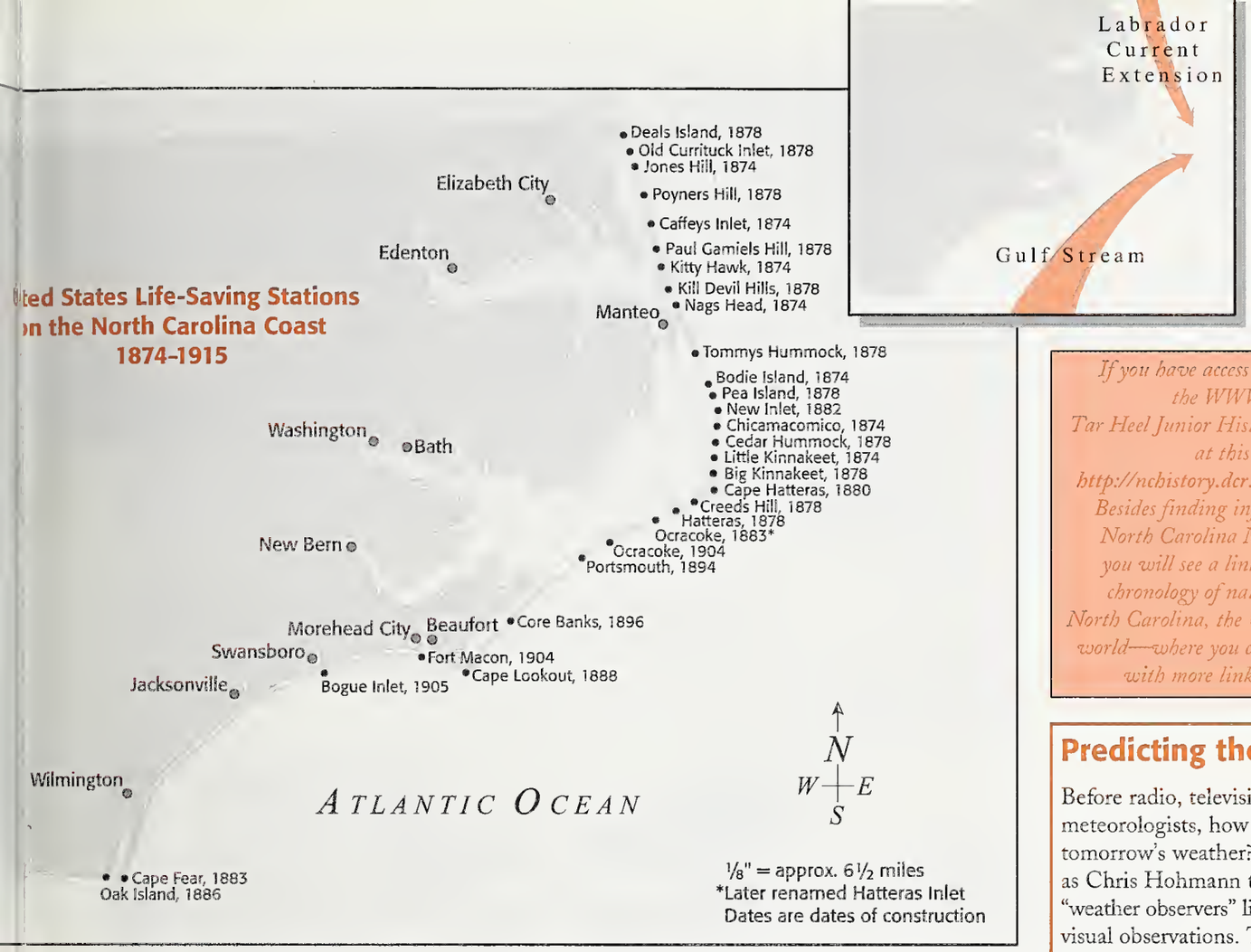


To help you understand these ideas, compare these two aerial photographs of the same area near Pine Knoll Shores on the Bogue Banks. The picture on the left was taken in July 1967, the one on the right, in September 1996—almost thirty years later. If the same natural disaster (a hurricane, for example) were to strike this area, at which time (1967 or 1996) do you think fewer people would have been hurt? At which time would less property have been damaged? Why? Based on your observations and conclusions, then, at which time would you say the "impact" of the natural disaster would have been less?

Another complication to understanding this idea is that the value of a dollar has changed over the years. If a house in the 1967 photo was destroyed, it could have been rebuilt for $35,000. If the same house was destroyed again in 1996, it could cost as much as $250,000 to rebuild. That difference is caused by inflation—the change in the value of a dollar.

Now do you better understand why natural disasters seem to have gotten worse over the years? And, do you see now why the dollar amounts of property destroyed in a natural disaster many years ago cannot be accurately compared with the dollar amounts of property destroyed in a natural disaster today?

You can make your own comparisons by shopping for household items you may have lost in the houses. Make a list of furniture that you need to replace as a result of a natural disaster. Locate a catalog from about 1967 (try a library for old catalogs—any year will help you compare prices), and find the costs of each piece of furniture. Add the costs to your list and add the numbers to get a total. Now, use a current catalog to find and record the present-day costs of new furniture. What is the total cost of replacing the destroyed furniture today? How does that compare with the total from the past? What other conclusions can you make about comparing property damages from the past with property damages from the present?



aveyard of the Atlantic

e and sidebar on pages 6 through 9
rth Carolina's own natural disaster—the
of the Atlantic. The two maps above may
o better understand why this area of hazards
ell as some of the steps that have been taken
ars to help sailors deal with it.

hips (in fact, most ships even until the 1920s)
red only by winds that pushed their sails and
urrents, which are a little like rivers of moving
e ocean. Captains knew where these currents
d, and they knew where the currents would
ships. Captains from northern ports knew, for
hat they could "ride" a part of the Labrador
ong the American coast to southern ports.
new they could ride the Gulf Stream
outh to the North.

g our natural disaster
tempt to help deal with it

e smaller map in the top, right-hand
s map shows the approximate locations of
ream and the Labrador Current Extension
oast of North Carolina. Notice that they flow
o the shore. In most other places, the coast
arply to depths that are safe for sailing ships.
he North Carolina coast, the waters are
shallow for great distances out. Can
e how this might cause problems?
ecause captains always wanted to keep
lose to shore so they could take advantage
rents. Unfortunately, they were not always
gh to avoid the invisible shoals and shifting
the shallow waters off our Outer Banks.

In response, lighthouses were authorized in the 1780s to help warn captains of dangerous areas. In the 1820s, lightships were anchored offshore, as well. While these warning devices helped reduce the numbers of accidents in some areas, they did not help save the crews who still met misfortune.

A modern response to our natural disaster

Now, look at the larger map. This map shows where lifesaving stations were built along the Outer Banks. North Carolina's first stations were built in the most hazardous areas in 1874—can you find them? How many can you find? (Do these locations tell you anything about where the most dangerous areas of the Outer Banks were located? Do you think the busier ports had anything to do with where these stations were built? Where were the busier ports at this time?) These first stations were located twelve to fifteen miles apart. Can you think of any problems this distance may have posed?

Well, the crewmen at a station were responsible for watching all that area. If they spotted a ship in distress, they had to run all the way back to the station to notify the rest of the crew. They then had to travel all the way back pulling all of their equipment. Tired as they were, they still had to start and carry out their rescue.

Looking at this map again, can you see what happened four years later? How do you think building new stations between the older ones helped with rescues? Notice, too, the additional stations that were built at later times. When was the last station finished? Can you think of events that happened after this time that reduced the need for lifesaving stations and crews?

Continue thinking about your observations as you look at pages 6 through 9. Do you now have a better understanding of our own natural disaster and what was done to help deal with it?

If you have access to the Internet and the WWW, go to the Tar Heel Junior Historian Association page at this address: http://nchistory.dcr.state.nc.us/museums/ Besides finding information about the North Carolina Museum of History, you will see a link to the magazine's chronology of natural disasters—in North Carolina, the United States, even the world—where you can continue exploring with more links to related sites.

Predicting the weather

Before radio, television, and meteorologists, how did people know tomorrow's weather? Well, primarily, as Chris Hohmann tells us on page 13, "weather observers" like Isaac Cline made visual observations. They looked to the sky and collected data from a few simple instruments. Thermometers, weather vanes, wind gauges, and barometers made up most of the weather-predicting arsenal in the first years of the 1900s.

But even if early weather observers had had more advanced equipment, they still had another problem, which Hohmann brings up on page 17. How could early meteorologists have relayed their forecasts to everyday people?

Instead of listening to weather reports as we can today, North Carolinians of not too long ago commonly used weather lore and folk expressions like these to "predict" the next day's weather.

"See a ring around the moon,
expect a morning cold with dew."

"When the fish are swimming out to sea,
bad weather is coming in to be."

"Crows fly low, winds going to blow,
crows fly high, winds going to die."

"Red sky at morn, sailors take warn;
red sky at night, sailors delight."

Talk to older relatives or neighbors in your community about weather lore and folk expressions they remember from their pasts. Make a list and compare what you find with what other club members find. Then, just for fun, use them for a month or so to predict the weather.

Think about natural disasters: More activities and exercises

Write, write, write . . .

". . . Outside, the birds were gone. . . . Pinecones were everywhere. There weren't many sticks on the ground. When I looked out the window, . . . there was a strong tree limb, which was on the ground. Right after the hurricane, it was hot. I was happy not one tree fell. We have some flowers, and I think the flowers got watered pretty good."

Those are some of Justin Hicks's memories of Hurricane Bonnie. Justin is a second-grade student at North Duplin Elementary School. His classmate Joshua Phillips had other memories. "When Hurricane Bonnie came through, our power went out. We used my mom's lantern for light. . . . Our windows were shaking. . . . I ate canned food, peanut butter sandwiches, ham sandwiches, and bologna sandwiches. I am very glad no trees fell on our house."

And another classmate, Thomas Aycock, added, "Hurricane Bonnie was very, very bad, but we stayed home that night. When it hit Faison, I was scared. That night, I got to sleep in my mommy and daddy's room. We looked at the news, and the weatherman said Hurricane Bonnie was coming. . . . It was scary, but we were brave."

Have you ever written about a natural disaster you were a part of? What did you say? If you haven't written about such an experience before, try to now. What do you remember? What happened? What did you feel?

You could also write a research paper about a natural disaster. That is how Katie Burkart began. She ended up with a paper that led to the contributions on pages 6 through 9. Her research also helped the Pea Island crew receive their gold lifesaving medals and united Coast Guard Captain Dwight Meekins *(left)* and Fire Chief Daniel Gardiner *(right)*. Meekins's grandfather was one of the surfman who helped rescue Gardiner's grandfather—the captain of the *Newman*.

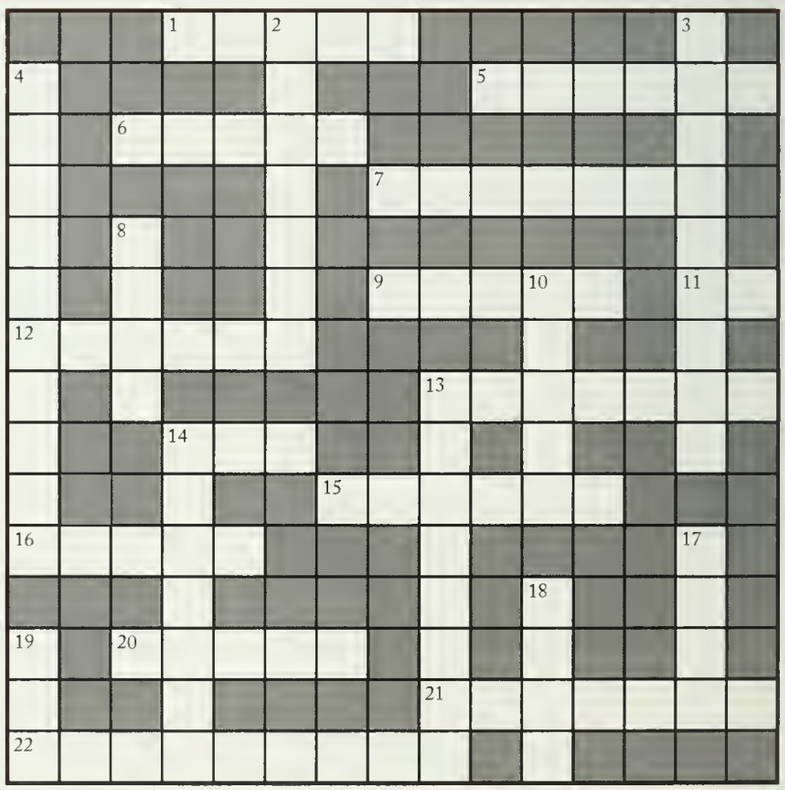
Better get started—you never know where your research and memories might get you!

Crossword of natural disasters

crossword puzzle design by Jaime Perez

Use the pool of words and clues below to solve this crossword puzzle of vocabulary from this issue. Be careful, though—a few extra "fooler" words are included to try to trick you. The solution is reversed below. When you finish, use some graph paper to try creating your own word find puzzle of natural disaster words.

apple
belief
blight
box
CD
comet
converge
Doppler
drought
famine
flood
Sandy Isles
forward
Fran
gust
hail
ham
hurricane
MC
meteorite
meteoroid
NCEM
Outer Banks
pox
prepare
quake
radar
recover
rescue
respond
speed
surfman
surge
tornado
tremor
tsunami
USLSS
volcano
WTRMN
warning
watch
wildfire

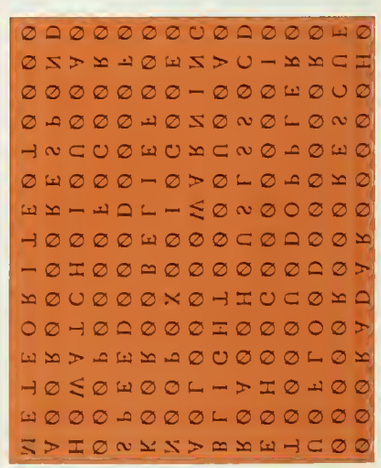


Across

1. Meteorologists have used these devices since the 1950s to locate and track the general movement of clouds and rain.
5. To save people from danger is to _____ them.
6. A _____ is caused when precipitation falls too quickly or drains away too slowly.
7. These scientific devices can detect rotating winds and differences in types of precipitation: _____ radar.
9. The _____ was established in 1870. It is now part of the United States Coast Guard.
11. This is the abbreviation for an agency that was first created to deal with the threat of possible nuclear attacks on the United States. Over the years, it has evolved into NCEM.
12. another word for a plant disease
13. Meteorologists and community leaders can issue a weather _____ when a natural disaster is actually threatening an area.
14. Today, we do not worry about them as plagues, but two of the diseases that killed many American natives were small_____ and chicken _____.
15. an idea that people have no doubts about
16. The measurement that tells how fast a windstorm is moving along its path is forward _____.
20. Meteorologists and community leaders can issue a weather _____ when conditions are favorable for a natural disaster in an area.
21. The three goals of emergency management are to help communities prepare for, _____ to, and recover from emergencies such as natural disasters.
22. a piece of solid material from space that survives the Earth's atmosphere and hits the ground

Down

2. a long time without precipitation
3. a kind of windstorm that gathers strength from warm ocean waters
4. the barrier islands that lie off the Tar Heel coast, these contribute to North Carolina's own natural disaster
8. _____ is a type of frozen precipitation that often accompanies summer storms and can cause great amounts of damage.
10. The storm _____ is usually the most deadly part of a hurricane or nor'easter.
13. a forest fire that has a natural cause
14. a word meaning "to get ready" for something
17. the benchmark hurricane for the 1990s
18. A _____ is a sudden and short increase in wind strength.
19. A person who operates _____ equipment, or amateur radio equipment, is a _____.



The residents of western North Carolina have experienced three devastating floods in the 1900s—in 1916, 1940, and 1971. Unquestionably the most severe of these floods was the flood of 1916, which resulted from the convergence of two separate storm systems, both natural disasters themselves. The first system was a large rainstorm that had slowly made its way from the Gulf of Mexico. The second was a former hurricane that had landed near Charleston, South Carolina. After forty-one hours of continuous rainfall and twenty-two inches of rain (a United States record for rainfall in one day), many communities in the North Carolina mountains found themselves under several feet of water.

Too much too quickly: Flood in western North Carolina

by Priscilla An Hopkins

Miss Nina Greenlee has lived all of her ninety years in McDowell County on property her ancestors settled in the 1790s. In the summer of 1916, she was a young girl of nine when her older brother came in for supper after finishing his chores in the barn. He reported that water was rising rapidly on that Saturday evening, July 15.

"It had been raining heavily since the previous evening, and the ground was already saturated," Miss Greenlee remembers. After the family finished eating, her brother returned to the barn and discovered that the water was knee deep. The livestock were quickly driven out of the barn in the hope that they would find higher ground and be able to survive.

Miss Greenlee's mother told the family to go upstairs for safety's sake. Fortunately, their house was situated on a hill on the south side of their property. In the darkness of that night, the waters that surrounded the hill, including Cane Creek to the north and the Catawba River to the east, continued to rise. "We all went to bed quite worried," Miss Greenlee recalls, and with good cause.

The memories are still vivid

The damage that was revealed by the morning's first light was devastating. "For the first time [ever] we could see the neighbor's house." As the waters receded during the day, the family could see why—the trees that had "always" lined both riverbanks had been swept away. In addition, the force of the rain-swollen Catawba River had eroded soil fifty feet back from its former banks.

"Debris from upstream—tree branches, even whole trees, roofs, and dead animals—had collected at [a nearby] railroad bridge. The bridge [had] held, but the banks on both sides [had] collapsed. . . . The next day, . . . a man walking to Bryson City came to the washed-out site at the damaged bridge and crossed it on his hands and knees"—he feared it would collapse.

Word of fatalities elsewhere in the county eventually made its way around. A man had drowned in Old Fort, and several deaths had occurred in the North Cove section toward Avery County. There, one young girl had been killed when a chimney fell on her. The rest of her family escaped to safety, but her grandfather was unable to remove her from the debris because he could not locate his ax in the water-covered ruins.

For Miss Greenlee and many other survivors, memories of the death and destruction that resulted from the 1916 flood remain vivid. The unparalleled devastation of that event is clear to them, even eighty years later.

Rain from two sides, then floods

The residents of western North Carolina

Perhaps the most severe damage caused by the flood of 1916 was to the Southern Railway. In the last half of the 1800s, the "Southern" had become the lifeline of transportation between mountain communities and the rest of the state. But during the flood, river currents and mud slides washed away miles and miles of track and damaged or destroyed much of the mountainside track beds (below and above, left). Of the numerous bridges that had been in use, in most cases, only the newer ones made of concrete and reinforced steel (above, right) remained.

have experienced three devastating floods in the 1900s—in 1916, 1940, and 1971. Unquestionably the most severe, however, was the one Miss Greenlee remembers so well. The flood of 1916 resulted from forty-one hours of continuous rainfall on July 15 and 16. The event was caused by a **convergence** of two large storms.

The first storm originated in the Gulf of Mexico. It hit near Mobile, Alabama, on July 5 and 6, causing extensive damage, especially to Southern Railway lines south and west of Birmingham. The storm continued slowly northeastward and ten days later stalled along the Blue Ridge Mountains of western North Carolina. The unusual severity of this storm alone rapidly caused creeks, streams, and rivers to reach flood stage.

Unfortunately, the effects of this **natural disaster** were compounded by a second storm, actually a former hurricane, that came from the Atlantic Ocean on July 14 and made **landfall** near Charleston, South Carolina. This storm moved northwestward with ever-increasing **intensity**. It quickly overlapped the same area that the first storm had drenched the day before.

There, rains from both storms fell—feeding the headwaters of the Catawba River and the French Broad River, even though both rivers were already at flood stage. At Altapass, approximately thirty miles northeast of Swannanoa, the National Weather Service reported more than twenty-two inches of rain—a new United States record for the highest amount of precipitation to fall in one day.

"Cut off from the rest of the world"

Farm fields and city streets alike were submerged by **roiling** waters, causing unprecedented property damage and loss of human life. Trees were uprooted, entire cornfields were washed away—in some locations, soil disappeared down to bedrock levels. Houses and factories were heavily damaged. Bridges were destroyed—basically, only those made of concrete and reinforced steel survived. And some of them no longer connected with land on both sides.

Perhaps the most severe damage caused by the heavy, heaving waters was to the Southern Railway. The Catawba River had swept away nine railroad bridges that **spanned** it. In addition, the Yadkin River had destroyed sixty-one miles of railroad line at and around North Wilkesboro. Altogether, 895 miles of track were destroyed or rendered out of service into the late summer of 1916.

With this much of the railroad out of use, the mountainous western part of the state was cut off from the Piedmont and the coast. In the fifty years since the end of the Civil War (1861–1865), "the Southern" had become the lifeline of transportation between the regions of North Carolina, providing the safest, easiest, and fastest way of travel.

The process of rebuilding

With rail lines out of service, the severe terrain of the area limited travel over the mountains to horseback, wagon, or buggy. Since transportation between the western Piedmont and the Mountain region was a necessity, the immediate repair of track from Old Fort to Asheville and points west became top priority.

In fact, inspectors and supervisors were walking along the tracks even before

Definitions, pages 21–27

Acres are ways of measuring area, especially land—one acre is equal to about ninety yards of a football field.

In this case, a benchmark is an event from the past that is remembered and used as a base for comparing newer, similar events. A benchmark flood, for example, was the biggest and "baddest" flood in memory and is the flood that all more recent floods must live up to.

In this case, the channel is the part of a river, stream, or creek where the main current flows.

To converge is to come together, or to join. The convergence of these two storms means that the two storms joined together into a larger system.

A disaster is a sudden and unexpected event, misfortune, or mishap that causes pain, hardship, and ruin to a community of people. A natural disaster is a natural event with a natural cause that leads to disaster. Natural disasters can include floods, hurricanes, tornadoes,

As floodwaters receded, mountain residents were amazed at the damages caused by mud slides and soil erosion. Here, you can see the former ground level by finding the dirt stains near the top of this stone well casing.

floodwaters began to recede on July 18. Along the way, they listed problems, rescued stranded passengers and crews, and assembled some materials for reconstruction.

Ed Norton, who had begun working with the Southern as a coal boy in 1911, found himself suddenly in charge of a trestle crew responsible for repairing part of the track. Although he had worked aboard trains as a fireman and brakeman as well as in the roundhouse repairing railcars and locomotives, he felt unprepared to become, in an instant, a railroad superintendent.

Still, after the track had been inspected on foot, Norton was told to "hire all the men you can get hold of and repair the track." Floodwaters had demolished trestles, and **mud slides** had carried away sections of the mountain. Both left tracks suspended in midair. Using wheelbarrows, picks, and

North Carolina before time—or at least 500,000,000 years ago

Imagine a string of islands surrounded by ocean waters. In the center of each island, smoke billows from the top of a small mountain. In addition, flames spew from the top of the mountain and from several points on its slopes. Molten rock slithers down the sides. Imagine—yes, a string of erupting volcanic islands.

This scene could describe the Hawaiian Islands in the Pacific Ocean. It could describe the Aleutian Islands in Alaska. But it does not. Instead, some scientists say this scene describes the heart of present-day North Carolina about 500,000,000 years ago.

A distant eruption once meant disaster here

Although the fiery explosions of nearby volcanoes are not a natural disaster that Tar Heels need to worry about today, some people in the United States, Mexico, and North America do. And we may someday have to worry about other kinds of threats caused by a distant volcanic eruption.

In 1816, Moravians who had settled in the western Piedmont of North Carolina noted strange weather. On April 30, someone recorded, "During this month the weather has been unusually cool for the time of year, and there have been heavy frosts at night. Plants in field and garden have been much retarded in growth. . . ." On August 22, another person wrote about a frost the night before.

Scientists today believe that this "year without a summer" was caused by the 1815 eruption of Tambora, a volcano in Indonesia. The volcano released large amounts of debris—volcanic ash and dust—into the atmosphere. As these clouds circled the Earth with regular weather patterns, dark days, cool temperatures, and excessive rains were recorded. Growing seasons were reduced, and in some places, crops were never even planted. People had to burn extra fuels to stay warm.

The Carolina Slate Belt (dark areas of map) in central North Carolina provides an outline for the location of the state's prehistoric chain of island volcanoes. Over the course of millions of years, the molten rock from these volcanoes cooled. Later, as the volcanoes became inactive and as the depths of the ocean receded, erosion began to fill in the valleys, and the North Carolina Piedmont was formed. The discovery of types of basalt as well as the belt's extensive deposits of slate help identify this area of volcanic activity. The locations of some of North Carolina's historic hot springs and mineral springs also help support this scientific theory.

But what about today?

Luckily, when North Carolina's volcanoes erupted, no people were around to be affected. In fact, Tar Heel residents still benefit from some of the changes that these prehistoric volcanoes caused. Geologists say that these volcanoes helped form the present face of our state's geography.

Do we risk another volcanic eruption here in North Carolina? No, says one scientist—"Not for the next few million years." We could again experience some effects of a distant volcano, however—events such as those caused by Tambora in 1816. But even those effects would probably not be disastrous for us today—inconvenient and perhaps interesting, but not disastrous.

Definitions (continued)

blizzards, droughts, epidemics, and plant blights, to name a few.

When the livestock were driven from the barn, they were herded together and guided outside so they could fend for their own safety.

Floodplains are areas of low, level ground that flood frequently.

In this particular use, floor growth is speaking of the ground covers—grasses, ferns, ivies, and low bushes, for example—that grow at the bottom of the forest to help keep soil, seeds, fallen leaves, and young trees from washing away.

Gusting winds are the sudden and short increases in wind strength that blow above steady, or constant, winds.

The source of water and the upper, or beginning, parts of a river, stream, or creek are its headwaters.

Humus is the organic material that forms on top of the forest floor when dead vegetation and animal matter begin to decompose.

Definitions (continued)

Intensity is the strength and persistence of a storm.

When a hurricane makes landfall, it has started to move over land.

In this case, mast is the accumulation of seeds and nuts that has fallen to the forest floor. Where allowed, mast was often eaten by free-range livestock, especially hogs.

Meal is the ground seeds of cereal grains (except wheat, which is called flour).

Mills are places that farmers take their grain so it can be ground into flour or meal. At this time, mills were small, often family-run businesses, and the wheels that did the grinding were powered by moving water, usually a river or constant stream. When this source of power dried up, the mills could not operate, and flour and meal could not be made.

shovels, workers began the task of rebuilding the rail line. The men were paid $1.50 a day, which was considered a good wage for the difficult and dangerous work.

The impact of the flood

Eventually the railroad reopened, but the flood of 1916 marked many individuals for life. It remains a **benchmark**, not only on

Natural disasters caused by cold spells (below), snow, and ice are relatively rare in most parts of North Carolina. But when they do appear, they often cause severe damage. Imagine, for example, a cold spell so cold and so long that the Atlantic Ocean freezes (left), as it did in January 1918 at Atlantic Beach. Or imagine snow so deep that you cannot get rid of it (below, left), as happened in Raleigh in February 1899. Or ice so thick it endangers power lines, fruit trees, and roofs. All of these events are possible, even in our southern state.

Cold spells, snow, and ice

from a newspaper account

North Carolina has some cold and wet weather, generally from December through February. But weather is unpredictable. It can and does change from what we expect. And when it does, we usually have to make changes, as well. These excerpts from an article in the Tuesday, January 22, 1985, issue of the *Winston-Salem Journal* report some of the conditions that North Carolinians had to accept and cope with.

"Coldest day on record shocks North Carolina: Temperatures in the 30s may bring relief today"

"An arctic blast shocked North Carolina yesterday with the state's coldest day on record, knocking out power to thousands and packing shelters. . . . Businesses and schools stayed closed, and authorities urged people to stay home. . . .

"The National Weather Service (NWS) said the cold snap broke or tied all previous records for low temperatures in the state. Daybreak brought sunny skies, but the arctic air that was blamed for three deaths on Sunday kept the state paralyzed, and forecasters predicted no relief until at least today. Highs are predicted to be in the 30s.

"'We're easily the coldest we've ever been in recorded weather history,' said . . . the NWS in Raleigh. 'Just about every city had all-time record lows, and most of these weather records start in [the] 1870s. . . .' Temperatures were expected to drop to around zero last night in the mountains, with lows in the teens along the coast. Winds kept wind chill factors below zero over most of the state yesterday.

"Atop Mount Mitchell, the temperature was minus 34, the coldest weather ever recorded in North Carolina. Farther north, winds gusting to eighty miles an hour pounded Grandfather Mountain, where the temperature in still air was minus 32. 'It's like a thousand pins being swept into your face,' said Harris Prevost at the Grandfather Mountain weather station. 'The wind chill factor went right off the charts, and the charts go to 110 below.'

"Prevost estimated the wind chill at minus 122.

"Despite the intense cold, two ski resorts in North Carolina stayed open—and people went skiing. Scattered cases of frostbite and hypothermia were reported, but neither Watauga County Hospital nor Cannon Memorial Hospital in Banner Elk reported admitting any patients as a result of the cold temperatures.

"Residents of the . . . coast also awoke to brutal cold. The 1,500 residents of Hatteras Island, for example, found themselves without power with the temperature at 7 degrees.

"Winston-Salem streets were icy in spots, and the city streets division was spreading sand in some places. Major roads were clear, officials said. But it was not the slick spots causing problems for motorists according to [a local] garage. Almost all of [the garage's calls] were from motorists whose cars would not start.

"Plumbing companies reported being flooded with calls, also . . . with calls about frozen and broken pipes. . . .

"[And] the subzero temperatures have caused some damage to fruit trees, ornamental shrubs, and other plants, say farm agents. . . . An agricultural extension agent who works with fruit growers [added that] the severe cold has certainly caused some damage to peach buds and possibly to the tree itself."

Floods are not only damaging by themselves. They can also be devastating when they accompany other kinds of natural disasters. Just like their larger counterparts, damages from "flash floods" can include drowning crops, animals, and people; washing away topsoil; knocking down buildings, blocking transportation routes, and interfering with communication lines; contaminating stocks of food and endangering supplies of drinking water; and disrupting social and economic activities.

the mountainsides and structures that have survived but also in the memories of men like Ed Norton and women like Miss Greenlee. Stories they hand down by word of mouth continue to tell about their roles in one of the state's worst natural disasters.

Other floods would disrupt life in the Mountain region before serious studies were done to measure stream depths, water speeds, and **channel** flows. Even more floods would come before proposals were made to protect Mountain people and communities from death and destruction caused by floods.

But eventually, changes did occur in western North Carolina. In 1933, the **Tennessee Valley Authority** (TVA) was established. The TVA built dams, lakes, and other projects that have helped control waters in Mountain creeks, streams, and rivers. In addition, slowly, local laws have been passed to discourage or prevent construction and development on **floodplains.** With these and other changes, a major flood in the Mountains will likely never happen again.

Heat waves and droughts

from entries in the Moravian diaries

It was 92 degrees in the **Triangle** Monday, another record. But that was not the hottest spot in the state. The mercury rose to 95 in Elizabeth City as a parched North Carolina baked again in a record-breaking April heat wave. . . . Wilmington also broke a record for the date, reaching 92, as did Greensboro at 89 and Cape Hatteras at 86. . . . The normal temperature for the date is 74. . . ."

Hot weather like this (reported in the April 23, 1985, issue of the Raleigh *News and Observer*) can be an unhealthy and inconvenient part of living in North Carolina. It always has been. The **Moravians** of the western Piedmont recorded some of the earliest weather observations in North Carolina. Their diaries and ledgers for 1816 note how one year of weather extremes, including excessive heat and drought, affected their daily work and activities.

After a wet and unusually cool spring . . .

JUNE 14. The heat is unusually great; yesterday the thermometer registered 100° and today 102°. *[This entry appeared in the Bethabara community journal.]*
JUNE 26. It has not rained for three weeks, but today it rained a little, refreshing the dry earth and somewhat moderating the great heat. *[Salem]*
JUNE 28. This afternoon we had a very hard rain, but a few miles from Salem it rained little or not at all. *[Salem]*
JUNE 30. . . . days were hot . . . *[Salem]*
JULY 7. A one-hour, hard rain refreshed the dry earth. *[Bethabara]*
JULY 23. . . . the weather has been oppressively hot. *[Salem]*
JULY 26. During the afternoon we had a fine shower, though it did not last long. *[Bethabara]*

The heat and drought take their toll

JULY 31. In addition to the great heat which prevailed during this month, there was such a drought at many places, especially in the Hope neighborhood, that fields and gardens suffered greatly, and some crops were entirely killed. *[Salem]*
AUGUST 3. In the afternoon we had a storm with a very heavy, but much desired, rain. *[Bethabara]*
AUGUST 18. For some time there has been a longer drought than in many years. The oppressive heat has been worse for the last two or three days. Yesterday and today the thermometer has stood between 100° and 102°. *[Bethabara]*
AUGUST 18. For a long time it has been hot and so dry that crops have died, and at many places there is a scarcity of **meal** for bread because the **mills** can run little or not at all for lack of water. . . . *[Salem]*
AUGUST 19. During the afternoon clouds rose in the distance, and during the night we had a hard rain, with some thunder close at hand. *[Salem]*
AUGUST 19. Today the heat rose to 104° above zero. *[Bethabara]*

sidebar continues on next page

Definitions (continued)

Molten is another word for melted. The molten, or liquid, rocks that come from volcanoes have temperatures of more than 2,000°F.

Moravians are a Protestant Christian religious group. They first arrived in the colony in 1753 and quickly began building a well-planned, tightly controlled congregational community around present-day Winston-Salem, an area that they called Wachovia. Wachovia contained three small religious communities: Salem, Bethabara, and Bethania. Each of these settlements had a Moravian church, and each church kept a set of journals in which information was recorded. Some of the entries in those journals tell us about the weather extremes that were experienced in the early years of the area.

Mud slides are one type of avalanche—a large mass of material sliding rapidly

Priscilla An Hopkins teaches an American literature class and Appalachian Literature and Culture at McDowell High School in Marion. Her mother's family, the Holtzclaws, have lived in western North Carolina since the 1770s. She is an alumna of the College of William and Mary and is proud to be on the same alumni list as Thomas Jefferson, though they are centuries apart!

"Elevated view of the French Broad River, Asheville flood, July 1916" and "new, steel-reinforced railway bridge" are both used courtesy of the Rare Book, Manuscript, and Special Collections Library at Duke University (both prints are from the North Carolina postcard collection). "Work crew on mid-air tracks" and the photo of a newly exposed well casing are used courtesy of the North Carolina Collection at the University of North Carolina at Chapel Hill. The photo of a flash flood covering a roadway is provided courtesy of Carolina Power and Light (CP&L) with assistance from J. W. Photo Labs in Raleigh. The photo of track bed undermined by a mud slide is from the North Carolina Division of Archives and History. The map of North Carolina's volcanic area is adapted from maps and information in Atlas of North Carolina, *published in 1967, and* North Carolina Atlas, *published in 1975 (both University of North Carolina Press).*

Definitions (continued)

down a mountainside or over a cliff. We usually think of avalanches as being made of snow, but they can also be made of dry dirt or rocks (commonly called landslides) or wet dirt or rocks, or mud (which are commonly called mud slides).

Products made from pine trees, such as pitch, rosin, tar, and turpentine, that are primarily used for building ships or making them seaworthy are known as naval stores.

The Outer Banks is the name given to the barrier islands that lie along North Carolina's coast.

Peat is a substance made of partly rotted vegetation, especially moss, which grows in moist, spongy soil. It is raised, dried, and sold for use as a soil substitute, fertilizer, or fuel.

A time of many prayers . . . and relief, at last!

SEPTEMBER 1. In the preaching service special prayers were offered . . . to give the land rain and growing weather; also that mills might no longer lack water needed for grinding meal. *[Bethabara]*

SEPTEMBER 1. . . . For many weeks it has not rained, and during the summer it has been so dry that nothing could grow in our gardens, no cobs could develop on the cornstalks, our mill had to stop for lack of water, and almost no meal could be secured. . . . *[Bethania]*

SEPTEMBER 5. This afternoon our faithful God sent us a hard rain, which somewhat refreshed the parched earth, and some mills were supplied with water. *[Bethania]*

SEPTEMBER 8. . . . the very long drought, which in some places has lasted twelve to fifteen weeks, has been relieved by a gracious rain which began today. . . . The fields and gardens had suffered greatly, and mills around us could not run. *[Salem]*

SEPTEMBER 8. Because of the unusually long drought the millponds and streams, far and wide, have nearly dried up. Last night and this morning this situation was relieved by a cloudburst, and our mill can run again after being almost entirely still for a considerable time. . . . *[Bethabara]*

SEPTEMBER 9. Yesterday it rained for some hours, and today it rained all day, so that our Muddy Creek, which has been very low, is full to the top of its banks. We are very thankful, for the need for meal can now be supplied, and we have hopes that something can be gathered from the gardens. *[Bethania]*

A review of the year

ADDENDUM. The very cool and dry weather in spring and summer hurt our grain fields badly, and it was

Wildfires and North Carolina's forests

from the North Carolina Geological Survey of 1895

Along with hurricanes and the shipwrecks of the Outer Banks, forest fires have long been some of North Carolina's greatest natural disasters. From the Atlantic coast to the Appalachian Mountains, forest fires, or wildfires, cause an amazing list of problems. At the top of that list, of course, is the loss of many, many trees.

But did you ever stop to think about the other losses and damages that wildfires can cause? Some of these damages can take generations to recover from. Tree roots and floor growth, for example, often take years to begin controlling erosion again. Sometimes the damages are irreparable.

Wildfires can also cause damage to many of the state's industries. In colonial days and until the early 1900s, for example, workers in the coastal naval stores industry needed pine trees both for "production" and for "new growth" so they could harvest not only then but in years to come. When old or new trees burned, their production of naval stores was endangered. In the Mountains, farmers used wooded areas, too—to feed their livestock.

Today, many industries continue to depend on the state's forests. Furniture makers count on having different varieties of undamaged hardwoods readily available. Other minor industries that are affected by forest fires include those that gather humus and peat, those that harvest cedar and pine mulch, and those that grow stock plants and Christmas trees. Additional businesses harvest forest trees for timber, for lumber, and for paper.

The following highlights come from the forest investigator's report of the North Carolina Geological Survey of 1895. In these excerpts of County Report Summaries, you can read about some of the damages that took place that year.

BERTIE: Numerous reports from this county state that . . . there were many small fires, mostly

[fueled by] leaf-fires. . . . A great deal of young timber was destroyed.

BLADEN: [Correspondents counted] a number of large fires during the spring months, [which] burn[ed] over hundreds of acres with an almost

Along with hurricanes and the shipwrecks of the Outer Banks, wild forest fires, or wildfires, have long been some of North Carolina's most damaging natural disasters. From the Coastal Plains to the Mountains, wildfires cause problems that may not be resolved for generations, if ever.

with sorrowful and troubled hearts that we gathered our second crop of hay and our corn crop, which were so scanty that we reaped only a third of what we usually get, and wondered how we could subsist until next year's harvest. This condition existed everywhere in our neighborhood, and almost everywhere in North Carolina, and we hear that in most of the states of America the corn especially is so scarce that it can hardly be secured. . . . Our orchards bore little, and what fruit there was has been injured by the late frost in spring. Only our wheat harvest was plentiful and turned out well. Our gardens also did poorly, so we were short there also. Yet we do not wish to complain, but to be thankful for the rich gifts which we have received. *[Bethania]*

People, livestock, and property can generally find ways to adjust to or cope with heat waves and droughts. As a rule, the biggest losses to these natural disasters are to outdoor plants and agricultural crops.

total loss of timber. One report places the number of acres burned at 5,000. . . .

Brunswick: The fires in this county were for the most part grass-fires. . . . A large portion of the county was burned over; [and] some turpentine timber was destroyed. . . . Firing . . . has kept most of the pines killed down and already killed out a large part of the young crop of long-leaf pines, which resulted from the mast of 1892.

Burke: There were 7,000 to 8,000 acres of timbered lands reported as burnt over in the south mountains alone, killing a large amount of pine timber. . . .

Caldwell: One correspondent states that he knew of nine large fires . . . from 10,000 to 15,000 acres burned. . . . Another correspondent mentions seven fires in his section . . . about 40,000 acres. . . . Young poplars and chestnuts suffer most from these fires, but white pines are very much injured, oaks are scarred and often injured for lumber, as is also the case with chestnuts and hickories. These fires, this correspondent thinks, will cause the gradual disappearance of the chestnut. The trees are scorched by the fires and decay sets in on the burnt side. . . .

Columbus: The large turpentine forests of this county have been gradually destroyed by fires, which have also burnt the young growth down as fast as it has appeared.

Edgecombe: More than two-thirds of the entire forest area of this county was burned over in February, March, and April. . . . [Wildfires] have burned down most of the boxed pines and destroyed the young growth of timber. . . . 60,000 to 80,000 acres must have been burnt over.

Mitchell: Thousands of acres, mostly on southern slopes, were reported as burned over during the past year. . . . On many south mountain slopes, many of the larger trees have been destroyed and only a brushy growth occupies their place.

Moore: The forests of this county have been devastated in the past few years by several large and destructive fires. One, in 1892, consumed a large amount of timber . . . and wiped the village of West End out of existence. Another, in 1893, destroyed long-leaf pine timber. . . . Fortunately, however, there were no destructive fires during the past year. . . .

New Hanover: There were between 3,000 and 4,000 acres in this county, covered with young pine trees, burned over. Many of the young trees were killed. . . .

Onslow: [This] county was visited by several destructive forest fires. One correspondent mentions five large fires which occurred . . . in the turpentine woods. . . . Another person . . . says that one fire . . . burned over about 8,000 acres. . . . This fire originated from lightning. . . .

Perquimans: Six fires occurred in April and May. . . . A great injury was inflicted on the underwood, which was all killed.

Sampson: A correspondent from this county, which lies in the long-leaf pine region, estimated that there were 100,000 acres of timbered land burned over.

Definitions (continued)

Roiling is a word for describing something, usually water or clouds, that looks turbulent—boiling water, for instance, or the bottoms of clouds that look like row after row after row of cotton balls.

To span is to cross or stretch across an open space. If a bridge, for example, crossed a river, it spanned it.

The Tennessee Valley Authority (TVA) is a government agency whose purpose is to improve life for residents along the Tennessee River and its tributaries primarily by improving navigation, producing electrical power, and controlling floods.

The Triangle is the nickname for the part of North Carolina that contains the three cities of Raleigh, Durham, and Chapel Hill.

"Ice at Atlantic Beach," "Snow in Raleigh," and the photo of a cold temperature on January 22, 1954, are from the North Carolina Division of Archives and History, as is the photo of drought conditions in July 1953. The three photos of wildfires are provided courtesy of the North Carolina Forest Service, Division of Forest Resources, Department of Environment and Natural Resources.

Lightning and windstorms and, yes—

tornadoes

by Betty Dishong Renfer

Definitions, pages 28–31

Doppler radar is a technology that has existed since the 1950s. Not until the 1990s, however, did the technology become practical for meteorologists. The primary advantages of Doppler radar over conventional radar systems (which only locate and track the general movement of relatively solid objects like clouds and precipitation) is that Doppler systems can detect rotating winds and can differentiate between types of precipitation. When linked together with a computer, Doppler radar systems can also determine wind speed, track wind direction, and establish the rate, intensity, and amounts of precipitation—all in very defined and specific areas.

The forward speed, or "pathway speed," of a windstorm—particularly

"We just moved here from New York, so we're not used to anything like this. We thought we were going to wake up in [the Land of] Oz."

Usually when we think of tornadoes, we think of states like Oklahoma, Texas, and Kansas. In fact, some people call parts of the **Midwest** and the **Gulf States** "tornado alley." The truth is, in the United States, which has the most severe tornadoes of any country on Earth, tornadoes can occur anywhere east of the Rocky Mountains—including North Carolina.

Yes, it *can* happen here

"I've been to Vietnam, and I ain't never seen anything like this. Right here at home."

Weather records reveal that a number of damaging tornadoes have hit North Carolina over the years. A tornado near Rockingham on February 19, 1889, killed 55 people and injured 23 others. In 1936, Greensboro suffered a major tornado. In April 1974, North Carolina was part of a two-day period known as the Super **Outbreak** of tornadoes that ravaged twelve other states and killed 315 people. More recently, tornadoes or violent windstorms have damaged areas near Raleigh (November 1988), around Winston-Salem (May 5, 1989), and north of Greensboro (March 20, 1998).

"We survived . . . I heard everyone talking about the roaring of the freight train. Then I heard it. If you hear that sound, you get right with your maker in a hurry. It'll put a fear in a grown man."

Tornadoes are **natural disasters** that are characterized by violent rotating winds. They are often accompanied by thunder, lightning, heavy rain, and hail. Besides their sound, and the strange yellowish, greenish sky color that many victims remember seeing in the moments before a tornado hit, people can easily recognize a tornado by its dark, funnel-shaped cloud. This funnel twists wildly about, rising and falling and dancing about without any pattern.

"I saw this bizarre-looking, tall cone that just bounced around, touching down and [taking] off. It was absolutely fascinating."

Wherever the bottom of the funnel touches the ground, the tornado can cause great destruction. This is because **tornadic** winds can reach speeds of 200 to 300 mph. Tornadoes generally travel in a northeasterly direction with a **forward speed** of 20 to 40 mph. A tornado might **touch down** only

When most people think of tornadoes, they think of places in the Midwest—usually Oklahoma, Texas, and Kansas. After all, these are the states that make up part of "tornado alley." But weather records reveal that a number of damaging tornadoes have hit North Carolina over the years. As you can see in these pictures, wherever the bottom of a tornado's "funnel" touches the ground, great destruction is the result. The damage you see here took only seconds—seconds of tornadic winds, that is. A tornadic wind is a wind that rotates in a tight circle within a small area. These winds can reach speeds of 200 to 300 mph. "Straight line" winds and "downbursts" have been known to cause similar damage.

briefly and then rise back into the air. Or it might stay on the ground, carving a path of several hundred miles through woods, fields, farms, and homes. Within a few seconds, one tornado can kill dozens of people and cause millions of dollars of damage.

"It's like you took a chain saw and cut down all the trees and leveled all the houses. Cars were thrown all over the place."

But statistics and numbers tell only part of the story of this type of natural disaster. The experience of living through it is the other part . . . What is it really like to be in a severe windstorm? How long does a tornado last? After reading these quotations and accounts, you should have a little better idea.

"We heard the roaring and we heard the booming rain. We just stayed in the bed holding each other."

Forsyth County: Friday, May 5, 1989

"The lights flickered on and off three times and there was a big boom. It felt like a bomb exploded. The house shook for several minutes and the roof fell in on two bedrooms. I thank God for saving our lives. You can replace material things, but you can't replace life."

In just twenty-one minutes, the face of Forsyth County was changed, some thought, forever. After the "vicious winds" and "horizontal rain" had taken away homes, trees, and electricity (see the adjoining timetable for details of this storm), all that remained was a stunned quietness. Carrying flashlights and candles into the blackness, the residents of Forsyth County cautiously inspected what was left of their property and neighborhoods. For lack of direction, many of them began trying to bring order—any kind of order—to the mess, even in the dark.

"Chain saws, buddy. That's the name of the game. Everybody's looking for chain saws. We had people standing in line here waiting for me to [open the store]."

In the days that followed, choruses of chain saws were heard from all directions. Strangers arrived from other counties, even other states, to help rebuild lives in exchange for smiles and handshakes. And folks relearned, some in fact learned, about being a family or a neighbor and a community as they helped each other through their situations.

"I had people banging on the door until 4 A.M. We sold by candlelight. We were the only place that was open."

For a while, most people lived without the conveniences of water, gas, electricity, and telephone. If they had, they shared whatever they had—food, saws, aspirin, even functional showers and kitchens. They survived, occasionally grumbling, eventually laughing, and always tired and frustrated. But they managed to "weather the storm."

"We used to have a split-level, but now we have a one-level!"

Just a bad windstorm?

"The wind blowed and it rained like hell. It shook and it rattled. It was a twister came through. I went downstairs in the basement. It hit pretty hard. But it didn't last long."

After the storm, everyone told their stories. And experts analyzed observations and facts and figures. Surprisingly, this storm was not a tornado. Official reports claimed that nearly all of the damage in Forsyth County was caused by high winds and "very strong thunderstorms." The National Weather Service report from the office in Greensboro said that only one "minor" tornado actually touched down in the county. That tornado rated only an F1 on the **Fujita Tornado Intensity Scale.**

"[My son] was frightened and asked if he could sleep with me. I was covering him up when the window exploded and I felt us being sucked backward. We went sailing out over the backyard in the bed. It was like something straight out of Mary Poppins. . . . We were up in the air . . . before we fell."

The rest of the county's damage was caused by downbursts, or violent downdrafts of air that can be as strong as 80 to 100 mph. Elsewhere, however, the storm spawned several tornadoes. In the seventeen counties where warnings were issued, six tornadoes were confirmed.

Definitions (continued)

a tornado or hurricane—is the measurement that tells how fast a storm is moving along its path. Wind speed is the measurement that tells how fast the winds are blowing within the storm.

The Fujita Tornado Intensity Scale, also known as the Fujita-Pearson Scale, is a system for rating tornadoes after they have passed an area. Tornadoes are rated on a scale of 0 to 5 according to their intensity, wind speed, suction power, path length, and path width. No system currently exists for rating a tornado's size before it strikes.

The states that touch the Gulf of Mexico are sometimes called the Gulf States: Alabama, Florida, Louisiana, Mississippi, and Texas.

Meteorologists are people who study the science of weather conditions and forecasting.

The states of the Midwest in the United States generally include the states around the Great Lakes and the upper Mississippi River Valley: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and sometimes Kentucky.

A disaster is a sudden and unexpected event, misfortune, or mishap that causes pain, hardship, and ruin to a com-

A day in the life of a storm: Timetable of a tornado

This is a timetable taken from the *Winston-Salem Journal.* It tells some of the human drama of a few of the victims in Forsyth County's tornado and windstorms that hit on Friday, May 5, 1989.

3:00 A.M. Meteorologists at the National Severe Storm Forecast Center (NSSFC) study radar screens and satellite photographs before issuing their severe weather forecast for the day. They also look at the continuing development of a strong system of thunderstorms that ravaged the **panhandle** of Texas the previous night. After consideration and analysis, officials list North Carolina as "having a slight risk for thunderstorms."

4:30 P.M. The system begins moving into North Carolina. The NSSFC and local National Weather Service (NWS) offices issue severe thunderstorm **warnings** and a tornado **watch** for some areas.

4:32 P.M. A radar locates severe thunderstorm activity and a possible tornado in Union County. The first tornado warning is issued. The NWS will issue thirty-three more during the night.

6:00 P.M. Paul Dellegatto, then meteorologist for WXII-TV 12 in Winston-Salem, prepares to give his evening weathercast. He sees an "impressive looking" **squall line** of thunderstorms stretching from West Virginia through Asheville and down to Georgia.

7:09 P.M. The squall line reaches Hickory, and the NWS office in Charlotte identifies tornadoes in Cleveland and Catawba Counties. Tornado warnings are issued. Minutes later, warnings are extended to Mecklenburg and Gaston Counties.

7:30 P.M. Heavy rains flood parts of Wilkesboro.

7:55 P.M. The NSSFC suggests that the NWS office in Greensboro issue tornado warnings for all remaining counties west of Forsyth County.

8:00 P.M. As severe thunderstorms topple power lines and trees in Alexander County, the NWS office in Greensboro begins extending tornado warnings to the east. Tornadoes are sighted near Statesville and Mooresville.

8:15 P.M. Dellegatto sees on his **Doppler** radar that tornadoes are forming in the thunderstorm. Instead of running a "crawler" at the bottom of the television screen, he decides to interrupt regular television programming to warn viewers about the approaching severe weather.

8:18 P.M. Dellegatto interrupts television programming again. Viewers later remembered he had a "look of urgency about him" as he advised people to get to their basements or other safe places. "I didn't want to scare anyone," he remembers, but he wanted to be taken seriously.

8:21 P.M. High winds begin doing serious damage to the town of Farmington. A church steeple is blown off and lands on a house next door; huge, old maple, pecan, and cedar trees are scattered across roads; and farm silos and grain bins are later found hundreds of yards away from their original locations.

8:36 P.M. An Emergency Medical Service (EMS) unit near Clemmons receives a call that a tree has fallen through a house and broken a man's leg. An ambulance is dispatched from Winston-Salem.

8:39 P.M. Two tornadoes are sighted in Forsyth County.

8:41 P.M. The ambulance en route to Clemmons checks in: "Visibility's about zero. We'll be going about 5 mph."

8:42 P.M. The NWS office in Greensboro issues a tornado warning for Forsyth and Stokes Counties.

8:43 P.M. The ambulance driver radios an update: "We're tied up in traffic. . . . We've got things falling down all around us here." The "things" included trees and utility poles, but cars were also being blown sideways one to two feet, and some were being turned over.

10:00 P.M. The man with the broken leg arrives at the hospital. But the ambulance crew never made its way to his home—the man's wife drove him in. The thunderstorms are over, now—only normal rain showers are moving out of the area, towards the middle and eastern Piedmont. Above, stars are now sparkling in a clear sky as victims begin to survey their damaged properties.

Definitions (continued)

munity of people. A natural disaster is a natural event with a natural cause that leads to disaster. Natural disasters can include floods, hurricanes, tornadoes, blizzards, droughts, epidemics, and plant blights, to name a few.

Tornadoes frequently occur in groups that are called outbreaks, or "families." Tornadoes in an outbreak form from one storm system but affect different areas—usually several counties, but sometimes, as in April 1974, several states.

In this case, a panhandle is a narrow strip of land belonging to one state that protrudes, or extends, beyond the main body of that state into the seeming space of another state. Florida, Oklahoma, Texas, and West Virginia have famous panhandles.

A squall line is the line of unstable weather that can develop at and near the boundary of competing

"The power went off in the living room while I was watching TV. When it went off the second time and came back on, I turned it off. That's when I started hearing the wind and feeling the pressure. It felt like my eardrums were vibrating. I had just stepped into the kitchen, and the house was flapping and popping. I grabbed hold of the wall and hugged it. When it went down, I went down with it. It was a few seconds, but it seemed like forever."

While hail was not present in this storm system, it usually accompanies these kinds of thunderstorms. When hail is present, it often causes a large part of the injuries to people and damages to property. Most other injuries in windstorms and tornadoes come from flying debris—splinters of wood, pieces of stones and bricks, and sheets of metal, as well as other objects (even bicycles, lawn furniture, and kitchen appliances) that are picked up and sent flying by the strong winds.

A 35,000-pound truck was picked up and carried across the street—it landed without leaving a skid mark.

Stoneville—heroes and helpers

Every tornado has its stories. Likewise, every tornado produces its heroes and its helpers. One hero of the tornado that hit Rockingham County and Stoneville on March 20, 1998, at about 3:30 in the afternoon, was five-year-old Joseph Doss, who happened to be in a restaurant with his father at the time. The *Messenger,* a newspaper serving western Rockingham and eastern Stokes Counties, reported his heroic story.

Many strong summer storms contain lightning and hail, which can prove dangerous to people and property. A lightning strike in 1872 was responsible for killing these cattle (below), which had gathered under a tree for protection. Hail can cause great amounts of damage to buildings, equipment, and crops (above), as well as livestock and people.

Joseph's father, a State Highway Patrol trooper, begins the story by recalling the day's events. "Everything was just black. It was very dark and the wind was blowing real hard," he remembers. "I told them the tornado was coming and they needed to try to find shelter. We were going by instinct."

Rose Siler, the restaurant's owner, remembers the day, too. "I told the ten customers and the employees . . . at the Garden Restaurant to get in the back of the building. 'We don't need to be up here around this glass.'"

Joseph, remembering what he had learned in his kindergarten class at Stoneville Elementary School, told everyone to get under the tables. Surprisingly, no one doubted the child, and they all did what he said.

"We basically just got up under the tables and prayed," Joseph's father says. "It sounded like you were up under a train that was running over top of you. The lights went out. You could feel the wind. You could see the walls up under the tables moving. It was like the walls were breathing. They came in and went back out. The ceiling began to fall. Bricks and limbs were coming through the building.

"It was over in about forty-five seconds. Most of the women were crying. The men were all shook up and visibly upset. Getting under the tables probably saved the people in the restaurant from getting seriously injured."

Reflection and change for the future

"We lost the big trees of Old Salem. It will take many years—two or three generations—to get big trees back. . . . We'll clean up, and we'll replant—that's what we'll do. That's all you can do. We really are lucky that most of Salem wasn't destroyed, because most of the trees fell toward the street."

After any natural disaster, survivors look around—and within—for things to be thankful about. "I don't think I'll ever take things for granted anymore," says Bettie Harvey. "When I look into that backyard, I see my life, my memories. I've learned what I can from the [storm], which is basically an appreciation for life."

"Several books that were on display in closed glass cases had some grit and debris between their pages. We still can't figure out how that debris got into books that were not even disturbed by the tornado."

In addition to personal changes, tornadoes can bring about changes in communities. Before the Stoneville tornado, for instance, the town had a library but no support group. When the storm's winds and rains left the library in shambles, people from across the county united to reopen it. They formed the Friends of Western Rockingham County Libraries group, which cleaned the library building and every book. On June 15, they held a party to let the community know their library was back in business. Since then, the group has continued to support the efforts of all libraries in the area.

After the storm in Stoneville, some schoolchildren were seen building "Lego towns" and then violently destroying them, saying a tornado had come. Other children were found to fear crossing a street on a sunny day because a tornado might appear—just as it had weeks earlier.

Small children often develop lingering fears after any natural disaster, but particularly after the suddenness of a tornado. To help ease some of those fears, every school and day care center in Rockingham County now has a weather radio that can help prepare students for the possibility of stormy weather.

Two lines of planes were parked about fifty yards in front of a hangar. Some of the planes were "picked up and dashed apart," while others were untouched. One plane nearest the hangar was not damaged nor was the bird nest inside one of the plane's air valves. The birds, in fact, could be heard chirping the day after the storm.

Tornadoes are "freaky" storms. They are unpredictable, unreliable, and inconsiderate. They can be totally devastating and deadly. They are quick. Some people might say they are the worst of the natural disasters that threaten North Carolina.

Definitions (continued)

warm and cold air masses (for example, an advancing cold front and a stationary warm air mass or an advancing warm front and a stationary cold air mass).

Tornadic winds are the tightly spiraling winds inside the funnel of a tornado.

The place where a tornado touches down is the place it lands on the ground. Some tornadoes touch down only briefly, while others stay on the ground for many miles.

Issuing a weather watch is one of the ways that meteorologists and community leaders help make people aware of threatening weather conditions. A tornado watch, for example, means that current conditions are favorable for formation of a tornado. As soon as a tornado sighting is confirmed—meaning a tornado has actually been spotted—tornado warnings will be issued for areas where that tornado could touch down. Once a tornado warning is issued, everyone in the predicted path should find shelter.

When Betty Dishong Renfer moved to North Carolina from Texas and Kansas nine years ago, she thought she was leaving tornado watches and warnings behind. Since arriving in the Tar Heel State, Betty has been a volunteer at the Museum of History and has researched and written for numerous issues of THJH.

The photo (page 29) of damage following a tornado at Clinton in March 1984 is provided courtesy of Carolina Power and Light (CP&L) with assistance from J. W. Photo Labs in Raleigh. "Tobacco damaged by hail, 1939" is from the North Carolina Division of Archives and History, as are the aerial photo of damage caused by a tornado at Fairmont, Robeson County, on April 30, 1947, and the two remaining photos on page 28 of damage to a home hit in Wake County in February 1939. "Struck by lightning!" is copied from the September 7, 1872, issue of Harper's Weekly. *Quotations in this article are taken from the May 12, 1989, issue of the* Winston-Salem Journal *and the March 25, 1998, issue of the Madison* Messenger, *with permission.*

The secret of 116 West Jones Street in Raleigh: Preparing for and responding to North Carolina's emergencies

by Tom Ditt

Definitions, pages 32–37

In this case, agencies are parts of, or offices within, a governmental bureaucracy. An agency can also be a place of business or an organization that operates primarily to serve people rather than making or selling products.

The cold war was (for the most part) not a war fought between soldiers on battlefields but rather a conflict of words and deception fought between political leaders in the United States and the Soviet Union. Most actions of the cold war involved accusations of spying, the spreading of propaganda, restrictions on trade, and the fear of nuclear attack.

In this case, dedicated means to be used exclusively, or only, for an assigned purpose. The dedicated phones were to be used only for that purpose.

To dissipate is to break apart and quickly disappear.

To NCEM, an emergency can be one of two types of events. The first type of emergency is an unexpected event that requires immediate action, a quick response—an overturned oil tanker on an interstate highway, for instance. The second type of emergencies are events that can be foreseen and even prepared for, to some degree, but for which actions and

Every day, hundreds of groups come to tour and explore North Carolina's Capital City. They gaze up at the statue of Sir Walter Raleigh. They pause in reverence and silent respect in front of the memorial to the state's Vietnam veterans. They sit in hushed reflection in the galleries of the Legislative Building. Some of them continue their tours to parts of the state government complex—the Capitol, the Governor's Mansion, the Museum of History, and the State Museum of Natural Sciences.

But few people visit the state government Administration Building. There, alongside some of the governor's offices, many people work to keep state agencies open and running. But the building also hides a staff that works deep inside it. These people, hidden twelve feet underground, are members of a team—a team that is ready to help out when your community is preparing for, responding to, or recovering from an emergency.

These are the people who work for North Carolina Emergency Management (NCEM). NCEM coordinates all state responses to emergencies in North Carolina. NCEM is a part of the North Carolina Department of Crime Control and Public Safety.

Let's take a tour of the underground at 116 West Jones Street

As you step off the elevator into the basement of the Administration Building, you enter the Emergency Operations Center (EOC). "Sign in at the receptionist desk," you are told, "and get your visitor's badge."

In an emergency, you can dial 9-1-1 for help. But what happens if your city or county has an emergency? Whom do they call? Who comes to help them if the emergency is too big and they need extra help? If they choose to, they can call the North Carolina Emergency Management agency. North Carolina Emergency Management (NCEM) is often called "North Carolina's 9-1-1." NCEM traces its roots to the days of World War II (1941–1945) and the Korean War (1950–1953). Then, it was called Civil Defense, or Civilian Defense (CD), and much of its work was to plan how to protect and defend American civilians in case of a nuclear attack or war here in the United States. In those days, safe places were designated with flags (left, top) and banners, and workers and volunteers were outfitted with helmets (near left, top) and nightsticks (near left, bottom). Duties included stocking survival equipment and supplies (far left) in "fallout shelters," or locations that had been made safe from radioactive fallout. The agency's name and mission slowly changed through the years. Since the late 1970s, it has been known as Emergency Management. NCEM now works primarily to help individuals, groups, and entire communities prepare for, cope with, and recover from large-scale emergencies, often natural disasters.

As you walk down the hall behind your guide, you can spot the staff members by their distinctive badges, yellow except for the red letters "SERT." In the background, you hear the sounds of crackling and popping radios, voices on a television tuned to the Weather Channel, and fingers on computer keyboards.

"This is the Communication Center," your guide begins, "the nerve center of the EOC. When an emergency occurs in North Carolina, this center is notified." Around you, you see eight large video monitors displaying different information to the people on duty. Each screen casts a greenish glow across the room. "Many people think this room looks like an arcade with video-game screens all around."

One monitor shows an ever-changing radar image of the United States. "Weather-related events," the guide reminds you, "or **natural disasters,** make up or contribute to a large part of the emergencies NCEM responds to. Look at the red splotches along the South Carolina coast. Those are thunderstorms. Our staff members will keep their eyes on those to see how they develop or if they **dissipate.**"

"Twenty-four hours a day, every day," we are always ready

When you look to the left, you see another screen. This one displays the agency's radio transmitter locations. Another displays a list of NCEM employees and their pager numbers. You are also shown a map with the locations of key emergency management people across the state and how to contact them. Then you notice all the telephones.

"A telephone is always within easy reach. The EOC is connected to a satellite telephone system," you are told. "The center also has a **secure** telephone link to each of the eight Highway Patrol communications centers across the state. By picking up one of those phones," the guide points to another bank of phones, "an operator can talk to any of the seven National Weather Service offices that serve North Carolina or to numerous surrounding states or the National Hurricane Center in Florida.

"Several other **dedicated** telephones link the EOC directly to the nuclear power plants in the state, as well as with offices in the counties that surround them. Yes, NCEM responds to man-made disasters as well as natural disasters," you are told. "That board," your guide points, "shows the **status** of the six regional 'haz-mat'—**hazardous materials** response—teams across the state. These units respond to spills or leaks of dangerous chemicals. In fact, Cedric and Kirk are working right now on reports dealing with a large traffic accident in Johnston County where a truck has spilled its load of roofing glue.

"Twenty-four hours a day, every day, someone is in the Communication Center. Should a man-made or natural disaster strike, that darkened room would be packed with people in a matter of hours. This room is

Today, NCEM works primarily in response to two types of emergencies: natural disasters and man-made disasters. Natural disasters include events such as floods, fires, severe thunderstorms, flash floods, snowstorms, tornadoes, and hurricanes. Man-made disasters include such events as nuclear power plant malfunctions, chemical spills, huge traffic accidents on interstate highways, and terrorist incidents like the Oklahoma City bombing. When an emergency strikes, NCEM helps to find and coordinate the assistance that comes from state agencies. If a community needs extra law enforcement officers, extra fire trucks, or extra ambulances, NCEM finds local agencies that can help quickly. If the community needs an airplane or a helicopter, NCEM assigns the request to one of the state agencies that operate aircraft. NCEM also works to get lives back to normal by helping to find agencies who can sift through destroyed homes and buildings, remove mountains of tree limbs, and replace electric lines and utility poles.

sometimes called the 'fishbowl,' because of its large glass windows."

The "desks" of West Jones

As you move into the next room, you turn to look back through the glass windows. The two workers do look like they are in a big fishbowl! "This room is called the Situation Room. It is a beehive of activity when the State Emergency Response Team is activated." So that's what those letters on the ID badges stand for, you think to yourself—SERT.

"If a community decides it needs assistance in handling an emergency, county officials call NCEM, and SERT is activated. Once SERT is activated, one representative of NCEM will go to the scene to help the local emergency management coordinator.

"In Raleigh, SERT members will be contacted and told to assemble at the EOC. SERT members are representatives from each state agency that can provide help in an emergency. Each representative has the authority to dispatch personnel or equipment from his or her agency to a disaster scene immediately upon request. Representatives are assigned to 'desks' according to the kind of help their agency can provide."

You are familiar with this part of NCEM. You researched the desks of NCEM in the report you wrote to earn your visit here. The assistance process actually starts here, you recall. If a community needs extra police or sheriff's deputies, it would call NCEM. The community's request would go to the Emergency Services desk. There, the "mission" would be assigned to an agency that has law enforcement officers. The Highway Patrol, Alcohol Law Enforcement, Division of Motor Vehicles, Marine Fisheries, State Capitol Police, Wildlife Resources Commission, and State Bureau of Investigation all have law enforcement personnel.

If a community needs help from agencies such as the Red Cross, the Salvation Army, or a mental health or social services organization, its request would go to the Human Services desk.

The North Carolina National Guard and the Department of Corrections are just two agencies that make up the **Logistics** desk. The National Guard can fly food supplies on helicopters to areas that are suddenly cut off. The National Guard also has large vehicles that can deliver supplies to people and large water tanks on trailers, called "water buffaloes," that can provide drinking water. During your research, you discovered that they did that last January (1998) following a **flash flood** in Avery County.

In addition, the Department of Corrections can supply prison inmates to help with clearing debris. Inmates helped in the cleanup effort that followed the Stoneville tornadoes last March (1998). The Department of Corrections can also be called on to help feed disaster workers as well as disaster victims.

The thought of Stoneville wakes you from daydreaming about your report and

When a community decides it needs assistance, officials call NCEM, and the State Emergency Response Team (SERT) is activated. SERT members include representatives from each state agency that might provide help in an emergency. These representatives have the authority to assign personnel and equipment immediately upon request. In addition to working within state government, SERT also works with other agencies in local areas. It helps city officials (above), for example, to locate heavy equipment that can help clear away debris (left), to find people who can assist in rescue efforts (next page, top), to open shelters that can provide housing and food (below), and to prompt utility companies and contractors who can begin reconnecting and restoring services (next page, bottom).

Definitions (continued)

responses cannot take place until after the events pass—hurricanes, for example, that can be predicted days in advance and for which preparations can be made, but whose damages cannot be responded to until after the storms pass.

Emergency management is the plan of having people and strategies in place and ready to assist with preparing for, responding to, and recovering from emergencies, which include natural and man-made disasters, and emergency situations.

As opposed to expected, predicted floods that are caused by day after day of hard rain, a ***flash flood*** *is a very local and contained flood that usually happens quickly.*

"Ham" is a label that traces its roots back to the days of telegraph communications, many years before radio. At that time, it meant "a poor operator." Over the years, though, amateur radio operators, possibly unfamiliar with its original negative meaning, started using it to apply to themselves and their equipment.

Hazardous materials are substances that can be dangerous and sometimes unpredictable, especially if they come under sudden

pulls you back to reality, and your tour. "At the **Infrastructure** Support desk, you will find agencies such as the Department of Transportation. They can furnish heavy equipment like bulldozers and dump trucks to help clear roads. They can also repair or replace road signs and traffic lights, if they are damaged or destroyed by a storm." You shudder again with memories of the tornado last March. "Also at this desk, you will find representatives from the Energy Division of the Department of Commerce. They can work with local power companies and electric cooperatives to help get power restored.

"During an emergency, more than one hundred people will work here around the clock until the emergency is past. When that time comes, another group will take over. These people are on the Recovery desk. Recovery is the process of picking up the pieces after a disaster has passed. Recovery teams first survey damages.

If a disaster is very bad, they can recommend that the governor request a disaster declaration from the president of the United States."

As the guide leads you out of the room, he informs you that "Last year, places affected by Hurricane Bonnie were declared disaster areas by the president, as were areas ravaged by the Stoneville tornado and the Avery County floods."

"That's our job"

As you walk back up the hallway, your guide begins to summarize your visit and to put the pieces together in an example for you. "Thirty North Carolina counties were declared disaster areas following Hurricane Bonnie last year. But SERT had been activated days before that time. By the time Bonnie slammed ashore near the mouth of the Cape Fear River, emergency workers were already organized and prepared.

"Early in the event, a special team was sent to Kinston to shorten response time. While the EOC was operating in Raleigh, this team opened a Logistical Operation Support Area (LOSA) at the National Guard Armory in Kinston. There, people and equipment were standing by, ready to respond to stricken areas as soon as conditions were safe.

"Trucks from the Department of Agriculture were ready to deliver ice and water to areas needing them. Large military trucks with generators were lined up on an old runway at the Kinston Airport as far as watchers could see. The Army National Guard and the Air National Guard waited side by side after making sure cots, plastic sheeting, and emergency food supplies were loaded and ready to roll out as quickly as possible."

You have reached the elevators again, but the guide continues for a moment. "Meanwhile, a staff of Public Information officers answered calls from the news media and the public. More than 1,400 calls were answered during Hurricane Bonnie. In addition, the NCEM home page was constantly updated to provide guidance and information." The guide hands you a paper with some information on it. You see it has the NCEM's Web address (http://www.ncem.org).

"While it's unfortunate that one person was killed during Bonnie's trek across North

Definitions (continued)

changes as the result of an accident— increases in temperature, decreases in pressure, or contact with air or water.

Bridges, roadways, signs and lights, sewer pipes, natural gas lines, outside electric wires and utility poles, telephone network tunnels, and television cables are some of the pieces of ***infrastructure*** *that are commonly impacted by natural disasters.*

Landline *communications are ways of communicating that rely only on wires and cables to carry messages— no radio waves or satellite relays are involved.*

Logistics *is the skill of planning and implementing the placement of personnel, supplies, and equipment.*

A disaster is a sudden and unexpected event, misfortune, or mishap that causes pain, hardship, and ruin to a community of people. A natural disaster is a natural event with a natural cause that leads to disaster. Natural disasters can include floods, hurricanes, tornadoes, blizzards, droughts, epidemics, and plant blights, to name a few.

In this case, ***secure*** *means that all efforts have been*

Definitions (continued)

taken to assure this line of communication will not fail, especially in an emergency such as a natural disaster.

Status, in this case, is another word for "current condition," or "current state."

Terrorism is the use of terror, or threats and violence, as a means of convincing people to change. The person who uses these tactics of change through fear and intimidation is called a terrorist.

Carolina, it could have been worse. It helped that we were prepared.

"That's our job—the job of the folks who work underground at 116 West Jones Street in Raleigh. We are North Carolina's 9-1-1! Thank you for visiting."

Emergency services and North Carolina

In one way or another, dealing with emergencies—preparation, response, and recovery—has been the job of NCEM for about fifty years. The agency traces its roots to the death and destruction of World War II (1941–1945), the dropping of the atomic bomb on Hiroshima, Japan (August 6, 1945), and the threats of the so-called cold war (1947–1991). The fears and feelings of those times led to a government agency called the Civil Defense Administration. Civil defense was created to deal with the threat of possible nuclear attacks on the United States—preparation, response, and recovery.

Over the years, though, public fears about nuclear attack and the chances of a nuclear war lessened. So, the job of North Carolina's civil defense office changed, as well. No longer did the agency need to supply gas masks, teach schoolchildren what to do during an air raid, or help build and stock underground shelters. Instead, the agency broadened its work to include all emergencies. It also changed its name in the late 1970s.

Today, NCEM is still changing with the times. Since the bombing of the federal building in Oklahoma City on April 19, 1995, and other terrorist events in foreign cities, NCEM has seen the need to begin making plans for dealing with acts of terrorism. As always, the people at 116 West Jones Street go to work with the hope that their services will not be needed. But in case they are, North Carolina's 9-1-1 is always there.

NCEM also helps to coordinate some of the efforts of national and international organizations such as the United States military (below) and the American Red Cross (above, right). Eventually, NCEM and most other agencies will move on to assist with other emergencies or will return to normal operations. The Red Cross, however, often continues to help victims with their recovery concerns for many months.

A graduate of Western Carolina University, Tom Ditt has an extensive background in radio, television, newspaper, and public information—skills he is using as an information officer with NCEM. He is also state coordinator for the Emergency Alert System (EAS), serving as a liaison between local governments, North Carolina broadcasters, cable operators, and the Federal Communications Commission (FCC). He is also a member of the FCC's National EAS Advisory Board.

"House being demolished following damage by Hurricane Fran" is provided by Marianne and Tom Wason. The photo of city officials working to make order from chaos and the photo of equipment arriving on flatbed trucks are provided courtesy of the Public Affairs Office at the City of Raleigh. The U.S. Marine Corps helicopter is from the North Carolina Division of Archives and History. "Red Cross volunteer carrying girl to shelter" is provided courtesy of the Triangle Chapter, ARC, from collections at the American Red Cross national headquarters. "Resurrecting utility lines" is provided courtesy of Carolina Power and Light (CP&L) with assistance from J. W. Photo Labs in Raleigh. "Emergency shelter at Kitty Hawk Elementary School" and "National Guardsmen in Nags Head" (both photos by Aycock Brown) are used with permission of the Outer Banks History Center in Manteo and assistance from the Museum of the Albemarle in Elizabeth City. The four artifacts on page 32 are from collections at the Museum of History.

Amateur radio operators save many a day

by Gary Pearce

When you pick up your telephone, you expect to hear a dial tone. You punch in the number to call a friend, and you do not think twice about whether or not the call will go through. It just always does.

Well, almost always. If you were anywhere in the path of Hurricane Fran when it tore across North Carolina in September 1996, you might have lost phone service for a few days. Or you might have found the phone circuits so jammed that you could not make a call even if your phone worked.

You were not the only one. Emergency management officials in Raleigh had trouble reaching officials in some of the counties that were hit by the storm. And when people at the National Weather Service (NWS) office in Wilmington tried to call their office in Raleigh the morning after the storm, they could not get through, either. For assistance, they turned to amateur radio operators, who used their two-way radio equipment to pass important messages between governments, organizations, and people.

They connect the whole planet

Amateur radio (the proper name) is often called by its nickname—ham radio. Most of the time, ham radio is just a hobby for more than 12,000 "hams" in North Carolina, 600,000 in the United States, and 1,000,000 more worldwide. Most hams have radio equipment in their homes that enables them to chat with old friends and make new friends across town or around the world—without using the telephone and sometimes without *ever* meeting face to face! Many hams also have mobile radios in their cars, and some even have handheld radios that they can carry with them. Hams can stay in touch with other hams no matter where they go.

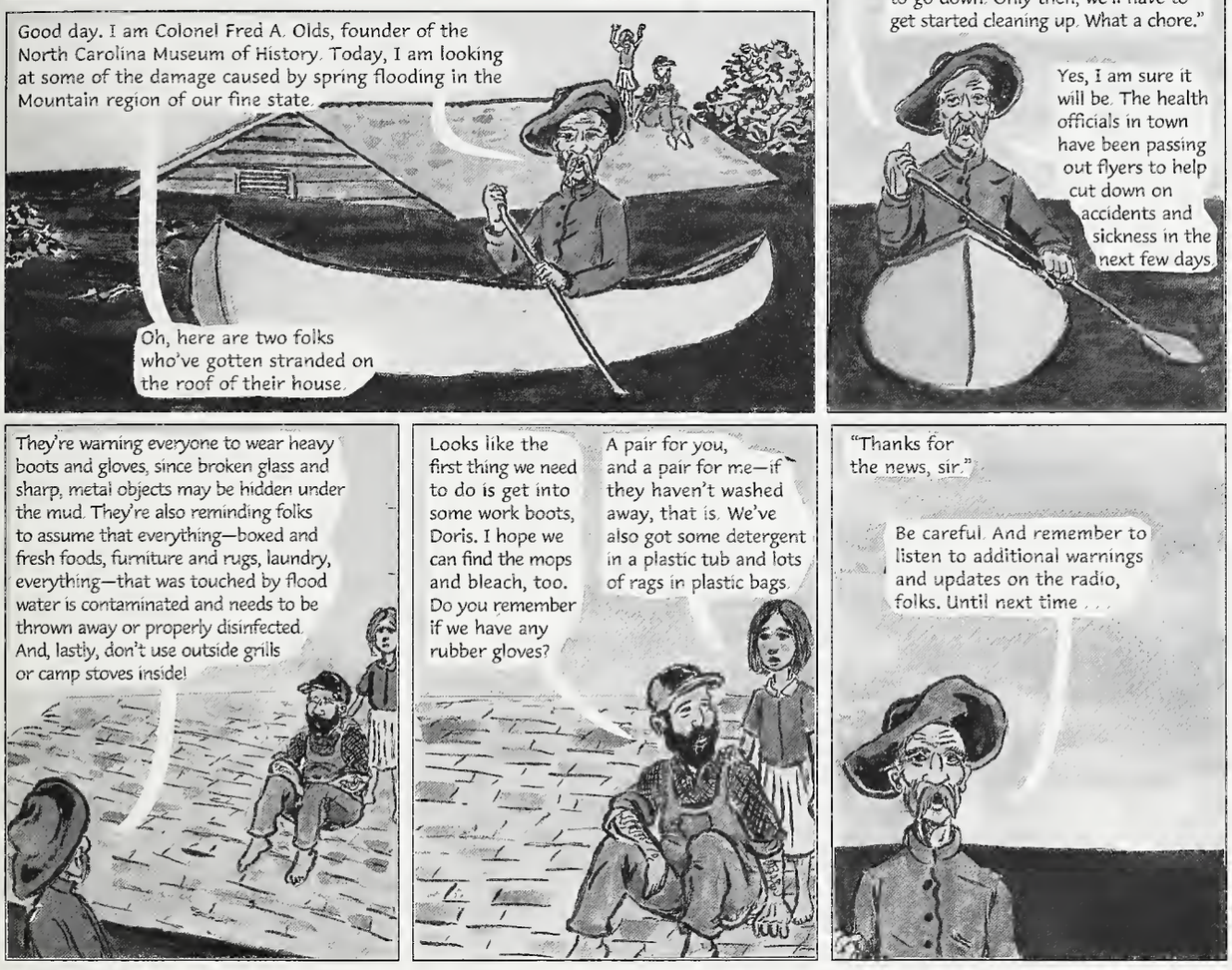
When natural disasters strike, however, and landline communications are crippled, hams are ready and able to pitch in to bridge the gap. Many hams do not even have to worry about electricity. They have battery-powered radios in their homes and cars. They also have stations set up at the North Carolina Emergency Management office in Raleigh and at local governmental offices in most counties, as well as at each NWS office. Hams usually staff these stations twenty-four hours a day during an emergency.

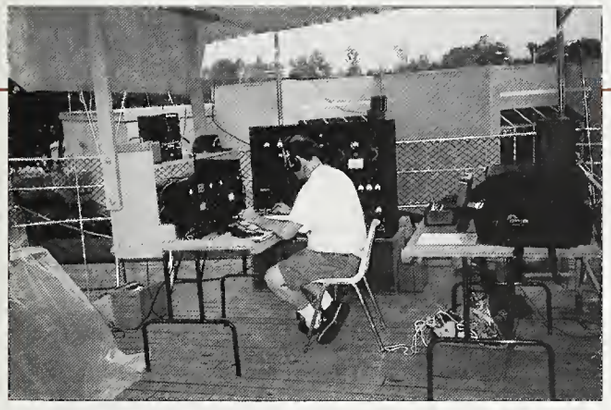
So, the next time bad weather knocks the phone out, don't worry! Remember that ham radio

The Olds Report

by Christian Poirier & Stephen Evans

Recovering from a natural disaster . . .


Good day. I am Colonel Fred A. Olds, founder of the North Carolina Museum of History. Today, I am looking at some of the damage caused by spring flooding in the Mountain region of our fine state.
Oh, here are two folks who've gotten stranded on the roof of their house.
Are you alright? What are you doing?
"We are fine. Jus' waitin' for the waters to go down. Only then, we'll have to get started cleaning up. What a chore."
Yes, I am sure it will be. The health officials in town have been passing out flyers to help cut down on accidents and sickness in the next few days.
They're warning everyone to wear heavy boots and gloves, since broken glass and sharp, metal objects may be hidden under the mud. They're also reminding folks to assume that everything—boxed and fresh foods, furniture and rugs, laundry, everything—that was touched by flood water is contaminated and needs to be thrown away or properly disinfected. And, lastly, don't use outside grills or camp stoves inside!
Looks like the first thing we need to do is get into some work boots, Doris. I hope we can find the mops and bleach, too. Do you remember if we have any rubber gloves?
A pair for you, and a pair for me—if they haven't washed away, that is. We've also got some detergent in a plastic tub and lots of rags in plastic bags.
"Thanks for the news, sir."
Be careful. And remember to listen to additional warnings and updates on the radio, folks. Until next time . . .



Since gaining popularity in the early 1900s, amateur radio has been a hobby for millions of "hams." But when natural disasters strike and telephone lines are down, ham operators can save the day by continuing to provide communications. When necessary, hams can set up mobile stations practically anywhere (above, top). Even when electricity has been knocked out, they can use battery-powered stations. Thirteen-year-old Drew Claybrook (above, left) of Stoneville first became interested in amateur radio following the tornado that devastated his community in March 1998. Since earning his license in August, he has become a reporter for Skywarn, a severe weather spotter network.

operators are still in touch, helping keep the lines of communication open.

You, too, can be a ham!

Amateur radio operators earn the privilege to use their equipment by learning basic electronics, understanding accepted rules and regulations, and passing a test administered by the Federal Communications Commission (FCC). After passing this test, each ham is issued a license, complete with a call sign that they use to identify themselves on the air.

Anyone can become a ham radio operator. The youngest hams are around seven years old. Many more get their licenses in their teen years. Others do not act on their interest in radio until they retire. You can learn more about amateur radio by using the Internet to find the Raleigh Amateur Radio Society Web site (http://www.rtpnet.org/~rars) or by visiting the Web site of the national ham organization, the American Radio Relay League (http://www.arrl.org).

"The Olds Report" was conceived and illustrated by Christian Poirier of Raleigh.

Gary Pearce is also known as KN4AQ, his "handle." Gary has been a ham radio operator since he was fifteen years old, in 1965. He is currently president of the Raleigh Amateur Radio Society, the largest amateur radio club in North Carolina. When he is not being a "ham," Gary is a video editor with a small company that produces documentary programs, training videos, ten-second commercials, and "everything" in between.

The photo of a mobile ham station is provided by Robert "Tim" Buehlmann. The photo of Drew Claybrook in action is provided by KF4ZQF himself.

Tar Heel Junior Historian Association

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